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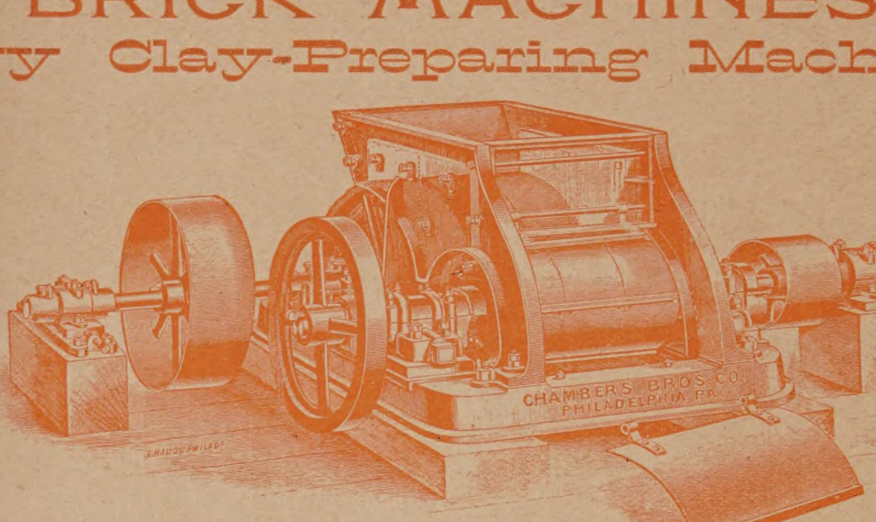

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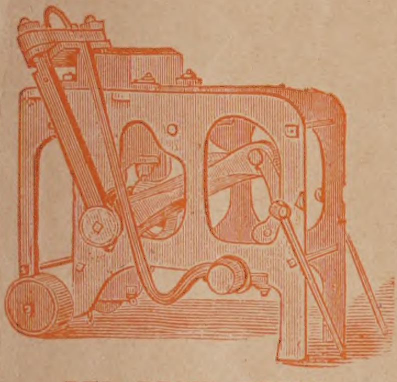

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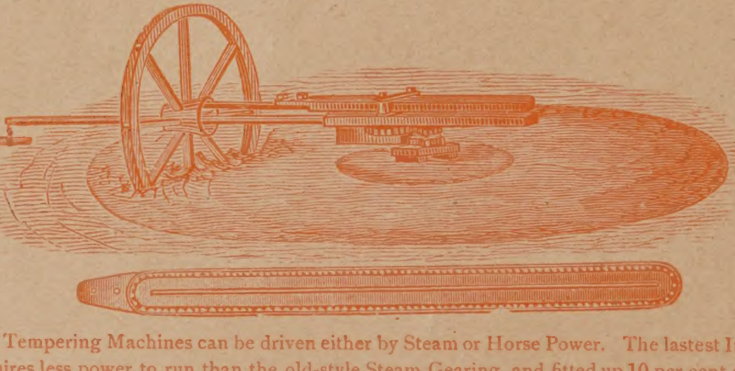

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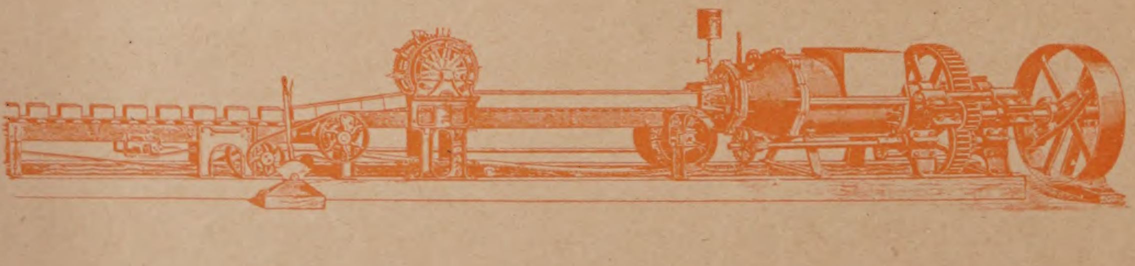

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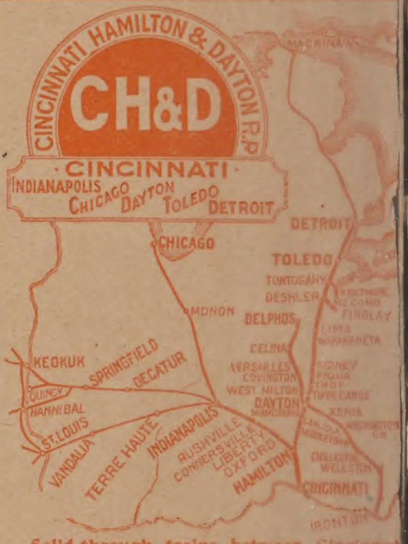

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Vol. 3

THE BRICKBUILDER

VOL. III. BOSTON, JANUARY, 1894. NO. 1.

STEEL AND TERRA-COTTA BUILDINGS IN CHICAGO, AND SOME DEDUCTIONS.

DURING the period included between the years 1889 and the present one of grace, local architectural history has been marked on several occasions, increasing in frequency during the latter part of the period, by the erection of office buildings exhibiting in their external construction a new departure in the exclusive use of terra-cotta as the protective material, a material which complements in the highest way with fireproofing qualities, great flexibility and capability of beauty, the strength and economy of steel, the use of which, with its own peculiar system of construction, has rendered these Ossa-on-Pelion buildings possible. Steel, mighty and sufficient to a certain point, needs to be used in connection with some other material which can supply its deficiencies; and stone and brick work, hitherto used for this purpose, being rigidly governed and limited by their own laws of material and construction, are consequently intractable to a degree which renders unsuccessful any attempt to express through their medium the totally different ideas and principles which dominate the steel skeleton system.

Possessing all the weathering and protective qualities of stone and brick, and also the pliability in which they are so lacking, the advent of terra-cotta (though new only in this connection) is therefore of the greatest importance, its use in combination with steel creating an entity which promises that a full development of its artistic possibilities will at last permit steel construction to have an architectural expression of its own. We may, therefore, hope,— and certain signs which may be observed by those who look warrant one in doing so,— that the customary mask of distorted masonry forms, belonging to other styles of building, behind which the steel construction of the day is obliged to rear its head, will disappear in favor of this more flexible covering which, adaptive and pliable to a degree that brick and stone are far from being, will assume forms determined by and identified with the constructional principles of the steel it envelops, clinging round the column and the beam as the flesh covers the bone, and conferring like it that appearance of individuality by which men are recognized,— forms which, springing directly from the fundamental principles of a new construction, may prove from this relation the factors of a new architectural era, just as the forms of that entire system of expression known as Gothic architecture may be traced back to a single principle of stone construction, — the Vault and the Buttress.

New architectural forms are the result of new ideas, new artistic reasoning, and new material. Terra-cotta and steel, representative as they are of modern ideas, and disposed as they will be in accordance with the artistic reasoning now beginning to formulate in recognition of the true nature of this co-operative material, have possibilities within themselves of an individual expression as great as that possessed in any other age by any other material; and to the styles represented by the brickwork of Babylon and Holland, the stonework of ancient Greece and mediæval Europe, we may soon add the steel construction of the New World. To those familiar with the high pitch of mechanic perfection which the constructional qualities of steel have already attained in the hands of the engineer, this may seem an unnecessary postponement, the number and size of the buildings of steel-skeleton construction seeming to indicate that that time has already arrived. That is, however, not so; steel construction of the present time, mighty and powerful as it is, still lacks artistic expression of its own; its only exterior indication in buildings reared by its help being the disregard which its strength has permitted architects to pay to the laws which should govern other material in construction.

The lack, so far, has been that of a material which, possessing the qualities in which steel is deficient, could at the same time entirely identify itself with steel forms.

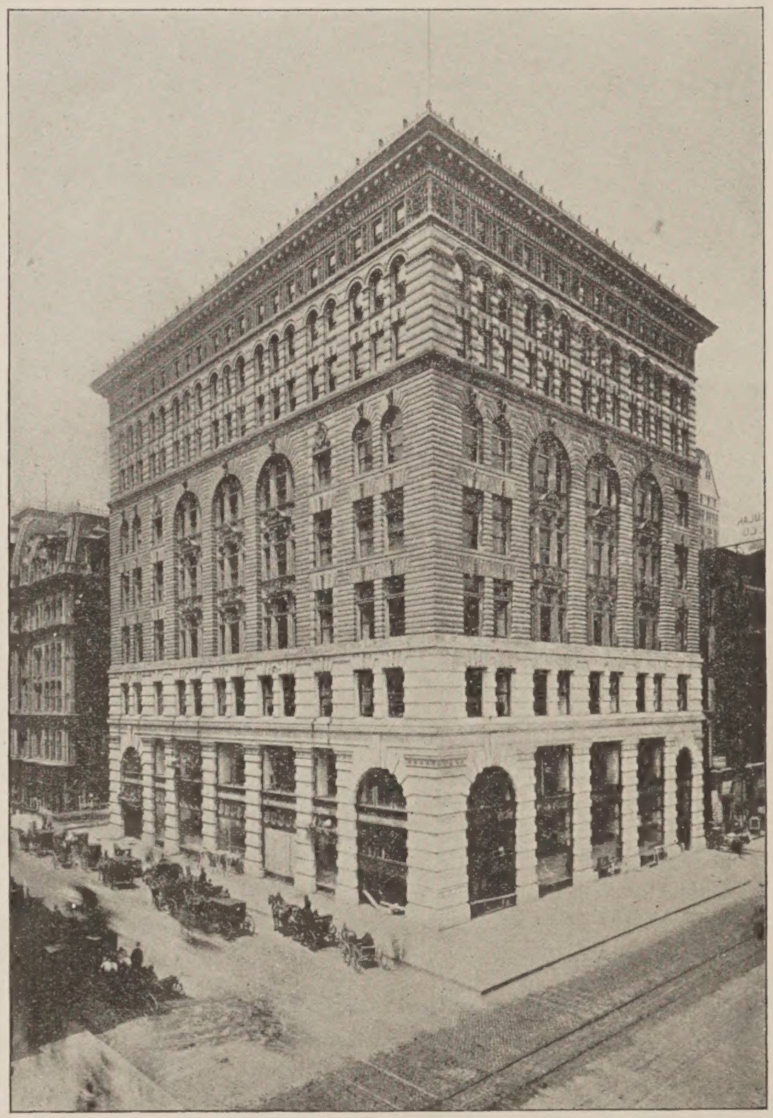
These two causes, —

1. The limitation of steel;

2. The intractability of the materials hitherto relied on to supply those deficiencies,

may be assumed as the reason of the antagonism between architecture (as at present understood) and modern construction, and also why such possibilities of artistic expression still lay dormant in a material which has reached such high constructional perfection. The promise, therefore, which steel and terra-cotta in combination seems to give is a fair one; not from the desire nor from the necessity for a new architecture, but from the advisability of having something that is architecture, a condition which is not fulfilled by the hybridism of most of the late buildings, combinations of two distinct methods of construction, — steel and masonry, — chiefly remarkable for the way in which the laws, obedience to which has made stone architecture beautiful, are disregarded in forcing and adapting the structural forms of this method to a set of conditions both structurally and artistically opposed to its fundamental principles. The word "masonry" may here be considered as a generic term including terra-cotta, the use of which, up to the present time, has been mainly that of a substitute for stone.

The controversy as to the proper expression of office buildings has been much debated, profusely illustrated, and never settled. Disputes, accompanied by scornful shrugs, witty denunciations, and characterized by a half-appreciation of the truth, have been hotly waged as to which of the many older styles of building was the most legitimate mask for a new one, which, naked but unashamed, a giant sprung into full existence, has had to temporarily drape his young and virile limbs with the garments of his ancestors, all of which, whether of classic, Gothic, or nondescript pattern, have proven ill-fitting and become stretched and distorted in the attempt to cover so huge a bulk. The history of recent building shows the gradual substitution of steel columns and beams for all interior walls and partitions, and their subsequent usurpation of the duties performed first by the exterior wall, and second by the masonry piers into which this system gradually collected these walls. There has thus been developed a system of building which is, as stated, really a combination of two systems; one, the column and beam, or steel-skeleton construction, which is sufficient unto itself as far as strength and rigidity of structure are concerned; condensing the equivalent strength of huge masses of masonry into the smaller area of a stronger material; effecting economy of space and labor, yet needing to be complemented with a certain amount of the other — the superseded masonry construction — to fill the voids between column and column, and beam and beam, and also protect these steel members from their arch-enemy, — fire. The demand for light in office buildings has reduced the first part of this remnant of usefulness to a minimum of spandrel and mullion, so that the mere elemental protection of the steel framework which it envelops, but which in turn supports it, is the sole duty left to be performed in these modern monuments by the materials which, wielded by different hands and animated by different spirits, have reared the pyramid of the Pharaohs, the mediæval vault, and the Renaissance dome.



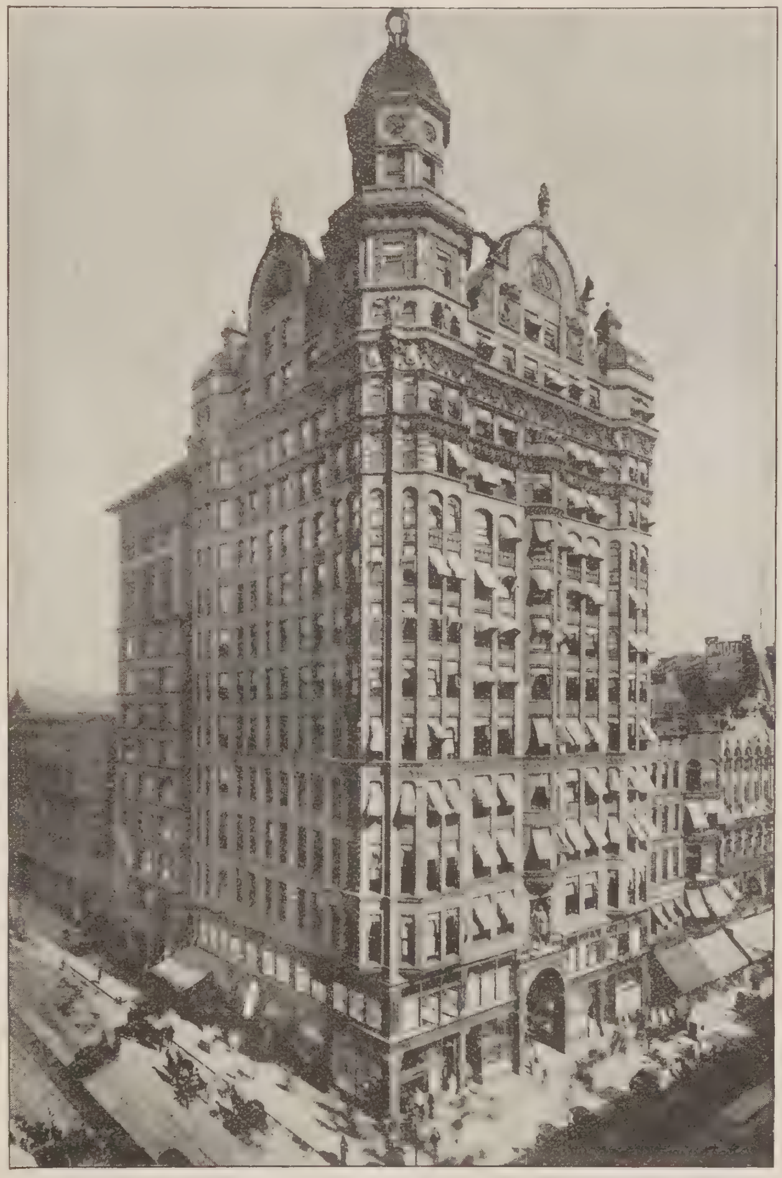
THE MARSHALL FIELD BUILDING, CHICAGO.
D. H. Burnham, Architect.

We have thus one system of construction masked by the material of another, with an ultimate expression as a consequence which is expressive of neither. The masonry, too intractable to express in its own material the real construction to which the building owes its stability, is, however, in spite of its reduced function, endowed by many architects of the present day with all the features that characterized it before the introduction of steel, when its duties were constructive and real; this, too, in spite of the fact that the amount of work done by the steel column receiving no exterior expression results in the masonry apparently performing all the exterior constructional work of the building, a state of affairs further complicated by the fact that the desire for light and the non-necessity for more material round the columns than protection from fire and weather demands has succeeded in reducing the bulk of masonry to a point where it is manifestly incapable of performing the duties ascribed to it. The use of masonry through all ages has developed an association in the minds of men of certain proportions and certain laws of structure imposed by the limits of the strength of material; and to minds occupied by these associations modern office buildings of the type under discussion, with their emaciated piers and obviously impossible arches, are utterly unconvincing as masonry structures; while the entire lack, so much to be deplored, of any expression of their real construction (beyond the crude disregard of the laws of the apparent construction) admits of no satisfactory effect on either eye or intelligence. They are mainly attempts to achieve the truthful and brilliant expression associated with certain forms by the use of an attenuated exaggeration of these forms, entirely void of their peculiar spirit or of the ideas they once expressed.

The advent of any material, therefore, whose use in conjunction with steel shall admit of buildings with forms true to construction, and expressive of the ideas and emotions of the present age, is one that can only be regarded as of the greatest importance.

Messrs. Burnham & Root in 1889, in the two façades of the Rand-McNally Building, inaugurated locally the extensive use which terra-cotta as a protective covering has since attained. Amply tested as far as weathering properties are concerned in the dozen or more important buildings which have followed the example set in the Rand-McNally, terra-cotta stands to-day a valuable and highly appreciated material, but one whose greatest property has yet to be made use of. The development so far has been entirely in the direction of its more decorative properties of color and ornamental surface, and the wonderful capabilities of the material in these regards have been abundantly proven. Limited somewhat in variety of texture, this deficiency has been filled by abundant use of decorated surface. Textures vary, in themselves and in the effect of strength produced, from the rough, coarsely hewn stone, which, with its vigorous crystallizations, seems capable of resisting great pressure, to the finely tooled surfaces in which this appearance has been smoothed away with an apparent loss of strength. The result of decorating large surfaces being to confer an appearance of artificial texture, the effects of rock-faced and fine axed stonework, and all the intermediary stages, have been paralleled in terra-cotta by the application of ornament; modelled decoration of bold and vigorous design, with large and deeply cut interspaces being akin to the quarry-faced surface on stone, and having, like it, an appearance of strength, while a surface covered with ornament of fine and minute detail reproduces more nearly the effect of a finely tooled stone.

This quality of easily recording decorative impress has been taken advantage of to a great degree, and perhaps has been largely responsible for the little development of the still more valuable property possessed by terra-cotta of expressing, by reason of its great ductility, the true nature of the substructure it shields. Two recent buildings, the Marshall Field Building, D. H. Burnham, architect, and the Columbus Building, for which W. W. Boyington is responsible, employ terra-cotta of the most ornate character. The Field Building, a store and office building nine stories high, and covering a quarter of a block, has the first three stories of granite and the next three of most elaborately modelled terra-cotta, the decoration emphasizing the character and function of each block, and giving an effect of interesting wall surface that is most grateful. The two stories above are of brick and terra-cotta, while the top story, and the cornice, with which it is to a certain degree incorporated, are again of terra-cotta of entirely decorative surface. The first three stories are in use as the store and tea room of Messrs. Field & Co., the next three being workrooms, etc., in connection with their business; while the remainder are offices. These divisions are clearly expressed exteriorly, the fenestration being admirable, especially in the re-enforcement of the angles of the fourth, fifth, and sixth stories; the elaborate surface decoration, mainly classic and Renaissance in motive, serving also to emphasize this expression of function, and though covering a large portion of the building never absorbing or hiding, but rather accentuating the mass. The entire effect is one of great dignity and scholarliness, of cellular function clearly expressed and material rightly used.



COLUMBUS BUILDING, CHICAGO.
W. W. Boyington, Architect.

The vertical lines which characterize the Columbus Building give it an entirely different expression to the one of repose which the Field Building derives from its many emphasized horizontal joints and divisions, and these two buildings may be taken as typical of their two different systems of construction. The walls of the Field Building constitute a self-supporting masonry shell which also carries its proportion of the floor loads and owes none of its rigidity to steel. These conditions insure compliance with all laws of masonry construction, and we are consequently not shocked by any of the vagaries which a hidden steel support has enabled some architects to play with architectural forms.

The Columbus Building, on the other hand, has no exterior wall in a masonry sense at all, the construction consisting of a number of columns and beams covered with a fireproofing coating of terra-cotta of modelled and plain surfaces, — a construction which owes allegiance only to the principles of steel. In spite of this, however, the protective material has been disposed in masonry forms, subverted wherever necessary to the exigencies of the real construction. This tendency toward allowing the steel to determine the forms of the terra-cotta, if carried to its legitimate conclusion, might have resulted in a truthful expression of a steel building, but for the insistence on an ultimate expression of masonry construction that now characterizes it, meagre and unconvincing to eyes educated by association with the proper proportions of true masonry construction.

The designer had in this case an opportunity which he neglected, — a fault to be found in nearly all the buildings.

Here was a steel building, complete in itself, except for certain elemental protection which its nature demanded, such protection being admirably rendered by terra-cotta, a material ductile to the greatest degree. What, then, would be the natural artistic reasoning in manipulating such covering? Why, surely this: Here is a building having been built of a certain material, which is sufficient as far as strength is concerned, admirable in the economy of space and labor which its use permits, possessing endless possibilities, but brought into a regular and ordered system by means of certain laws and principles which rigidly govern its use. This material has, however, to be supplemented in one regard by some other material, and one is quickly found whose chemical composition renders it perfect for such purpose, while at the same time it possesses unbounded capabilities of recording artistic thought; it owes obedience to no system of laws which would be antagonistic to its use in the proposed position; it is weak where the strength of the steel renders such weakness unimportant, and possesses to a very high degree those qualities wherein steel is deficient. Having thus the building of steel on the one hand, and this subsidiary material on the other, it would be by far the most natural, the most logical, and the most artistic proceeding to apply this protective coat to the steel skeleton in such a manner that the steel construction should determine all forms, and dominate the ultimate expression; that the terra-cotta should faithfully follow each line, advance where the steel advances, and retreat where such is the action of the construction, indicating joint or connection, flange, cap, and bracket, — a true and faithful indication of the substructure, modelled into beauty by the hand which applies it. Instead of this reasoning, however, another one is followed at the present day, resulting in buildings which would be terrible in their hopelessness did one not know that they are merely transitional features in the progress towards a better state of affairs; and that such buildings wherein the real construction vainly struggles for expression under an elaborate travesty of masonry forms, will be considered in their proper light merely as the anomalous productions of a disturbed period of transition before the iron-setter finally triumphed over the mason.

The necessity of a tower on a modern business building has perhaps never been demonstrated to a sufficient degree to permit one to accept, for the sake of others, the specimen which in company with an aggregation of gables and domes constitutes a top for the Columbus Building of the utmost rampant fussiness. Fully appreciative of the better effect upon our streets that varied and picturesque sky lines have the power to confer, one nevertheless prefers them to be logical developments, and regrets that the Columbus Building was not terminated at the thirteenth story, the simple and legitimate outline of which is infinitely preferable to the arbitrarily disposed masses, which, inconsequential and having no connection with the rest of the building, are piled in confusion above in a vain attempt to please a vaguely wondering eye.

The chief sensuous impression left by the building is one of perpendicular lines bound together at the sixth, twelfth, and thirteenth stories by bands of elaborate decoration. With the exception of these decorated courses all ornamentation is limited to the spandrels, which, recessed from the columns and mullions, still further emphasize the smallness and thinness of their masonry character. In this regard the building is a distinct contrast to its neighbor, the Venetian Building, a steel-skeleton frame, protected with brick and terra-cotta. Here the first nine floors are emphatically divided by heavy horizontal lines, a treatment logical enough (as indicative of floors), but which is suddenly abandoned in the tenth story for an entirely opposite motif, whereby two stories are merged, as far as exterior expression goes, into one; the piers, so consistently divided below, running without a break through two stories, the windows of which are treated as an elaborate Romanesque arcade of terra-cotta. This curious treatment is also to be observed in the Old Colony Building by the same firm, and though the reasoning of which it is presumably the outcome may be logical enough, one fails to appreciate what idea it is intended to express. The terra-cotta of the Columbus Building is of a reddish brown color, and the decorative detail is marked with great effort after what is popularly known as picturesqueness, consisting mainly of shields, coats-of-arms, and other forms apparently connected with the life of Columbus; a slight infusion of eagles testifying that unabated patriotism qualifies this tremendous admiration for a foreigner. The feeling pervading all the modelling is distinctly French, and impresses one as being the work of a different mind from that which conceived the building as a whole. Barring the extraordinary congregation crowded on top of it, the building has a certain look of alertness and activity due to the slight degree to which the construction has been permitted to show itself, the continuity of simple, straight line where allowed conveying an impression of *élan* which argues well for the effect of future progression in the same direction.

The group of buildings designed by Messrs. Adler & Sullivan differs largely in character from those just considered; and, though opinions may differ as to their beauty, they are consistent expressions of certain ideas, and embody in their mass the views of this well-known firm.

The Schiller theatre and the new Stock Exchange Building (see plates 6 and 7) are both steel construction covered entirely with terra-cotta, and evidence very largely a great and growing appreciation of this material in its new application.

The Schiller, a theatre and office building, has a façade in which the central portion is continued eight stories above the remainder and treated as a tower from base to cornice. The simplicity of the massing and the unity of effect that has been achieved are very striking, and is still further heightened by the plainness of the surface treatment and the judicious distribution of the ornamental relief, — a disposition which ably reflects Mr. Sullivan's views that such ornaments should be entirely subsidiary to the massing, and that its absence should in no way affect the general impression. That fatal crux, the difficulty of harmonizing the imperatively necessary large openings in the first story with the massiveness of the superstructure, has been encountered in this building as in so many others; and herein is the weak point of the building. The introduction of an elaborately ornamental balcony at the second story, instead of providing a transition from the large voids below to the lesser openings above, with the suggestion of weight which their surrounding wall surface gives, serves only to confuse the mind as to the point from which the tower springs, and deprives the latter of the greater effectiveness it would gain from a clear and pronounced footing on the ground. The simple straightness of the tower piers, — one uninterrupted line for fifteen stories, — and the consequent idea of a direct transmission of weight, renders an appearance of adequate basic support for this tremendous load most necessary for any completeness of æsthetic satisfaction. The balcony, however, introduces rather an element of confusion into the hitherto clear and natural scheme of transmission, interrupting it just where a clear view is most necessary.

This difficulty, so often encountered with disastrous results, is yet one that with our present resources seems avoidable. If, as is evidently so, the first-story supports are adequate for the weights they carry, it should be possible to express this fact convincingly, and thus convey a satisfactory sensuous expression. The material that performs this tremendous work is steel, and, again, steel superimposed on steel. In terra-cotta we now have a material which can make this construction as evident in the finished building as it is when the columns and beams stand naked of all other material. The clay, properly moulded on the columns and assuming their constructive forms, would create a satisfactory artistic expression of their mathematically sufficient capabilities. One can, however, forget this fault in gazing at the top, where, after an uninterrupted spring from the second story, the tower piers are terminated with arches at the sixteenth, and the openings of the seventeeeth become an arcade surrounded with a wide band of surface ornament, similar to that which effectively decorates the boldly projecting, absolutely rectangular cornice.

A fact that strikes one in regarding the building is that from the first-story columns to the cupola of the tower there is not a single form that is not enclosed either by straight lines or straight lines and a semicircle. This simplicity of outlines undoubtedly aids in emphasizing the effectiveness due to the simple massing, and helps to confer on the building its characteristic air of magnificent self-poise and serenely born decoration. This latter quality is throughout very individual, and very effectively used. A slight fault both of composition and expression is to be found in the pilasters, which are placed on each side of every window of the tower. These not only destroy in some slight degree the unity of expression which the building presents (by an after intrusion on the attention), but in their seeming support of the entire lintel convey an impression totally at variance with the straight joints of the latter, which indicate that some support not visible is the means of their retention in position.

The terra-cotta throughout is brown in color, set with red mortar joints, the blocks of various heights being arranged as are quoins and filling in ashlar masonry.

The Stock Exchange Building, by the same architects, is one of the latest buildings that has been erected in town, and, being entirely of steel and terra-cotta, one naturally looks with interest to see if the movement toward the expression of steel construction which the sheer line of the Schiller piers seemed to inaugurate, has attained any further development. One looks in vain, however; the building has the rectangular simplicity of outline so characteristic of this firm, and is to a certain degree clearly expressive of the cellular function; but there is no indication of construction except where it is self-evident that something beyond the apparent means must have been employed. The ground floor is occupied by stores, the second and third on the left of the entrance by the stock exchange hall, two stories high, and on the right by banking concerns. The next nine stories are offices, and in this portion there is absolute unity of expression; the disinclination observable lately in big buildings to endow window openings with any character has culminated here in an absolute denial to recognize them except as mere openings framed simply and similarly; bays being depended upon to give relief to what might otherwise seem like vacant staring.

The ornamental modelling on this building is treated in a much more delicate way than is the Schiller work; and Mr. Sullivan states his belief that this material, which will record the impress of a thumb, has still further capabilities of refinement in this direction looking forward to the time when even the plain terra-cotta blocks shall be hand-modelled. The desire to use the decoration so that its entire absence would not affect the mass of the building is everywhere the guiding idea in its disposition.

The buildings designed by Messrs. Adler & Sullivan always inspire interest on account of the ideas they express, — the recognition of the possibilities of impressiveness which these office buildings contain in their mere mass, their logical subdivision, the simplicity of outline so consistently emphasized throughout the buildings by the use of nothing but the simplest forms and the subordination of everything to a simple unity of effect; but at the same time one would like to record, with all courteous recognition of the necessity of other opinions, that, though the ideas represented are truthful and logical, they are only half the truth, and that the buildings of this firm suffer not from what is in them, but from what has been omitted.

The office portion of the stock exchange, for instance, certainly satisfies that reasoning which insists that similar function be expressed by similar forms, but the repression of all character in the windows leaves unsatisfied that part of us which cries for beauty, and though one would welcome the same idea expressed through beautiful forms, one shrinks from giving any recognition to the rather barren means of attaining the same end now employed. The history of windows is the history of civilization, and from the time when as mere openings they were but incidents in the wall space, to the period when the mastery of the laws of poise and counterpoise permitted those magnificent combinations of painted glass and stone tracery through which the stained sunlight fell in glory of hue on the Christian worshipper, they, until the time when Renaissance rules bound and straightened them into non-expressive symmetry, expressed in their form their construction and the nature and importance of the cells to which they admitted light. In the Stock Exchange building these beautiful traditions receive no recognition whatever, the character of the openings being purely arbitrary, expressive of neither construction nor anything else, bad in proportion, and utterly lacking in interest or beauty, and indicative only of a desire to suppress and deny them. This, it must be admitted, is not the best way to extract the inherent good of anything. The Champlain Building, by Messrs. Holabird & Roche, is another example of this return to primitive principles carried to a greater extent.

Recent terra-cotta architecture would therefore seem to be far from satisfying those canons which demand in art creations truthful expression, unity, and, at the same time, variety; and in many buildings the bare steel-skeleton is infinitely preferable to the ultimate appearance conferred by the protective material. The reason for this, I think, lies in the clinging to old-forms which are not adapted to their present position, to the ill-assorted alliance between an elder and a younger method of building, in which the forms of one become a mere distortion consequent upon the attempt to make them express emotions with which they have no sympathetic connection; and to an attitude of misunderstanding which exists between architects and their materials.

Architectural forms are the result of constructive methods, and the methods are determined by material and artistic reasoning. Changes of ideas, changes of material, have resulted in new methods and new forms through the history of architecture until the present day, when the new forms of which new materials and new methods are capable lie undeveloped, while all energies are bent to reap the merely commercial benefits which accrue from the use of steel. It may safely be asserted that the main association of idea in connection with steel construction is entirely that of its commercial advantages over other materials, under present conditions, to the exclusion of every thought of what beauty of form and expression it is capable. In true architecture two great things are always to be found: —

I. Proper thought, care, and regard for all necessities of construction and the nature of material.

II. The analysis of motive and the proper expression of the idea with the material used.

The first part of this *sine qua non* receives attention as far as mere stability of construction is concerned, but the construction in steel buildings is always considered as a separate thing apart from the ultimate expression that the building is to assume. The structure as a whole is usually divided into three parts: the exterior consisting of such forms generally confined to those in use during some particular era, as the architect may be pleased to select; the interior also calling for discreet selection of the same sort; and the construction sandwiched between the two, a thing apart from both.

The remedy lies ready to our hands. When shall we learn to use it?

G. TWOSE.

Jan. 6, 1894.

BRICK AND MARBLE IN THE MIDDLE AGES.

CHAPTER I.

> Yet waft me from the harbor-mouth,
> Wild wind! I seek a warmer sky,
> And I will see before I die
> The pains and temples of the South.
> — *Tennyson.*

ROUTES TO ITALY, PARIS, STRASBURG, ROUFFACH, BASEL.

AN architectural journey in Italy seems to afford about as much prospect of pleasure and information combined as any which it is possible for an English student to take. He may see, if time allows, so much on his road, that whether one thinks of the journey or the end of it, all is, at any rate in the perspective, charming. And in these days when, what with railways, through tickets, and Cook's and other guides for timid tourists, the journey from one end of Europe to the other is made so quickly and so cheaply as to be within most educated men's reach, it is no wonder if most of us in our turn make the venture.

Many are the ways by which one may reach the north of Italy, but one or two only of them seem now to be commonly used, to the exclusion of all others, and with great loss of pleasure to all travellers who make the journey more than once. The natural, because the quickest, road is now by the Mont Cenis tunnel to Turin, and for the country described in these pages nothing can be more convenient. But when my first journey was made it was more easy to take one of the passes leading to Milan, and so I went by the Splugen. Since those days I have found my way to and from Italy by other roads which I recommend strongly to others. I pass by such a well-known road as that by railway over the Brenner, in order to suggest three other roads, either of which brings the traveller down upon Venetia in the happiest possible frame of mind if he is at all capable of being moved to pleasure by the sight of exquisite scenery, pleasant and religious people, the roads and country not too much crowded with tourists.

The first of these is by the Lake of Constance, the Vorarlberg, and the Vintschgau to Botzen; the next by the Brenner pass through Cortina and Cadore-Titian's country to Gonegliano, and so by railway to Venice, a road lighted up by the wild beauty of the Dolomite mountains and now unaccountably neglected by English tourists; the third, and perhaps the most charming, though somewhat indirect, and requiring more time, again by the Brenner as far as Franzensfeste, thence by railway to Lienz, stopping to see the fine church and Dolomite mountains at Innichen on the way, and then by country carriages from the Pusterhalin to the Gailthal, where there is the most charming combination I know of pastoral and picturesque scenery, seasoned by interesting old churches; and thence to Ober Tarvis and by the stern and magnificent Predil pass to the head of the Adriatic at Gorizia, whence, after seeing Aquileja and Grado, the traveller may, with halts at Udine and Pordenone, reach his goal at Venice by railway.

But in this my first journey to Italy, I was sufficiently happy in finding the Spulgen prescribed for me as on the whole the most convenient mode of reaching in succession all the spots which had most special interest for me. My scheme was to make myself fairly well acquainted with some of the most interesting Italian cities north of the Apennines, and for this purpose to descend from the Spulgen on Bergamo, and from thence to go on to Venice, halting as often as necessary by the way, and then to return by Mantua, Cremona, and Pavia, or by Ferrara, Bologna, Parma, and Piacenza to Milan, and so home. And railways, if they have made the journey somewhat more easy than it was, and have deprived it now and then of the charm which always attends the recollection of impediments and difficulties on the road, have not in any way altered the advantages of such a route for those whose tastes are at all akin to those which I carried abroad with me in those days, and carry still with undiminished strength. Whether, however, one enters Italy by one pass or another, the first part of one's journey is by the well-known road to Paris, which, by reason, I suppose, of its being the prelude to nearly every holiday tour that I make, never seems to be stale, old, or too well known.

There is something very novel, and it strikes me more every time it is seen, in the aspect of everything directly you have crossed the Channel. Indeed, there is no country in Europe so much as France, and no city, perhaps, so much as Paris, which strikes an Englishman as being foreign in its aspect, and new in all its customs and proceedings. The dress of every one, the arrangement of the railways, the harnessing and character of the horses, the mode of life in hotels, and the ordinary habits and pleasant traits of the middle classes, are all quite fresh to the English eye. Nor is the aspect of the country less so; fields cut up into small strips of a dozen kinds of crops, unprosperous-looking cows, each feeding discontentedly and drearily tethered to a man or woman, on a small patch of grass; corn cut and then stacked in small cocks for a month or two of exposure to the pleasant changes of the atmosphere; and the entire absence of hedge-rows and other trees than poplars, all go to make up a thoroughly un-English picture.

After skirting the coast and its dreary expanse of sand-hills, reminding one very much of those singular sands on the north coast of Cornwall, which are so often shifting about, covering up new churches, or uncovering the old oratory of some early British saint, we reach the banks of the Somme, and then travel along a poor peaty tract of country until the famous west front and short but lofty nave of Abbeville come in view. Thence by a valley (rather more rich than is common in good churches), we continue our race for Amiens. Among these churches I may instance the hipped, saddle-back roofed steeples of Picquigny, Hangest, and Pont Remy, as very valuable examples of their order; that of Picquigny, indeed, surmounting a central steeple, and finished at the top with some delicate open ironwork, is about as graceful a specimen as I know.

At Longpre is another church with a steeple of some pretension, but not satisfactory. It has a perforated spire of stone much too small for the size of the tower, and ungraceful in the extreme.

At Amiens one always longs to stop again and again to feast one's eyes upon its glorious cathedral, perhaps after Chartres and the Parthenon the noblest and most masculine piece of architecture in the world. But with us this was impossible; our destiny was, come what might, to endeavor at any rate to discharge ourselves in Paris within the shortest possible number of the early autumn evenings prevented our having more than the very slightest glimpse of the Minster.

The refreshment room at Amiens is one of the best I have ever been in, — reasonable, clean, and good, — and placed just at that happy distance from the sea at which the poor wretches who have been in the depths of woe on the passage begin to recover their presence of mind, and with it, of course, — as good Englishmen, — their appetites; what wonder, then, if the Buffet at Amiens prospers!

The rest of our journey to Paris was all performed in the dark, relieved only by the sight of the then long-expected comet, and it was almost midnight ere we found ourselves settled at our hotel.

I am never sorry to have a day in Paris. In spite of alterations and reconstructions which have converted an interesting old city into the most spick-and-span place in the world, there are even to the present day parts which are untouched by the improver, and full of a pleasant national character which seems to be little to the liking of the rulers of the French. There is, too, in spite of the changes which a great and rich city must always undergo, a great deal which is interesting to the architect. We may look at great engravings, and wish ourselves back in those old times when the walls surrounded the city, where now the Boulevards run round its heart, when the Temple and a number of other important buildings, now wholly destroyed, adorned the country just outside the walls; but the city which has still, among other architectural treasures, such churches as Notre Dame, S. Germain des Pres, the Sainte Chapelle, S. Martin des Champs, and a host of lesser lights, and the Chapel of Vincennes, and S. Denis within a short drive, is in quite a different category from such a city as London, and is indeed hardly second to any other in Europe in architectural interest.

To come to much later times and very different work, it is always pleasant to walk down the Boulevard des Italiens to the Madeleine, and for a few minutes to gaze at a church which certainly presents one very grand idea, — that of space clothed in very gorgeous dress. One always feels a certain sympathy for a church in which so many people are ever praying, and I have never yet been into this church without being able to count them by scores. The last time I was in Paris I remember being struck by seeing for the first time a peripteral building made really useful. The walls within the columns were hung with rich draperies, and a long procession coming out marched round the circuit of the church between the columns and the walls, and in again at the west door. The effect was, as may be imagined, very striking.

From the Madeleine we found our way to the new church of S. Clothilde, a large cruciform church, and the last erected in Paris in the Gothic style. Its design is intended to be of early character, but in reality is quite late in its effect; nor do I know when I have seen anything much less successful than the two western steeples rising but a short distance above the nave roof, and looking mean and weak to a degree. In plan the church is not badly arranged, there is just such a choir as might easily be properly used, and a large space for congregational purposes.

How much we want churches, in this respect at least, somewhat like S. Clothilde in our large cities in England!

There are here a great many windows filled with stained glass, executed, I believe, by Mons. Marischal. His windows are illustrations of a truth which men are very slow to receive and act upon; viz., that in decorating a transparent material, one whose transparency moreover is the sole cause of its use, we have no right to shade it with dark colors so far as to destroy its brilliancy. These windows were elaborately shaded, and, as a necessary consequence, were heavy and dismal in their effect, besides which most unpleasant mixtures of green, yellow, and ruby, and of ruby and blue — very glaring and very bad — abounded.

The carving of the capitals is, as is usually the case in recent foreign works, all derived from natural types of foliage, and is fairly well done; but the carving of rather elaborate sculptures of the "Stations" did not please me, having none of the severity of ancient examples. When shall we see a school of sculptors rise able really to satisfy the requirements of the times? I confess I despair more on this point than on any other; for I have as yet seen no fair attempt made to recover the style, or work upon the principles of the best mediæval sculptors. The work of our modern sculptors is nearly all foreign and unreal, and almost always involves the assumption that they are representing the proceedings of the Greeks or Romans, and not of the English; it is impossible, therefore, that such a school can be healthy, strong, or successful. We lack men who will give us (clothed with as much anatomical correctness as they like, so that they do not leave them lifeless and academical) representations of subjects from English history and national life, illustrations of the Scriptures which we still believe, of the faith we still profess, conceived in something of the architectonic and yet really dramatic and romantic spirit which marks the best sculpture of the Middle Ages. The strange thing is that, with works near at hand which few living men could rival, they absolutely refuse to study them at all, and I believe if we were to summon all the eminent sculptors to a conclave and put them to the question, not one in four of them would confess to having ever been to Chartres or Bourges, and four out of five would assert that it would have done them no good if they had. If they would give us anything at all comparable to the great works of the best Greeks, the case would be altogether different, but to be served with a *réchauffé* of the antique when one is crying out for something suitable to the present, is cause enough for the apathy of the English public about sculptors' work. We ask for English history or Bible story, and are treated to nymphs combing their hair; and for figures of our Lord and St. Peter, and get nothing but Musidoras and Clyties. No sculptor would lose much by the study of the best mediæval examples of drapery, and there are among the Gothic statues which deck the doors and porches of the churches I have named, some of the most admirable description, such as warrant any one, who is at all troubled with feeling for his art, in using strong language about those who neglect them. In Italy we shall find the same careful shutting of men's eyes to what is good, simply because it belongs to the thirteenth or fourteenth centuries. Orvieto is left on one side in order to spend time over work not possessed of a tithe of the beauty of that on its cathedral façade; and, indeed, just as the French examples, they appear only too often never even to have been so much as heard of!

The study of ancient sculpture in England is not quite so easy, because our old buildings are not so rich in it as are the French; but if one is told — as one is too often — that the art of sculpture in the Middle Ages was unknown or rude in comparison with its state now, one may fairly refer to some of the modern attempts at its imitation for a proof that this was not the case, as, *e. g.*, to the recumbent effigy of Archbishop Howley at Canterbury, or to another, of some more humble individual, in the south transept of Chichester Cathedral; a glance only at which, and a comparison with some of the noble mediæval effigies lying in all the stateliness of their repose by their sides, will at once show any one that it is not merely necessary to put an effigy upon its back with its hands in prayer in order to vie with the effigies of the thirteenth and fourteenth centuries. The position is something, but not all, and requires very much more skill in its treatment than of late years we have had to bestow.

From S. Clothilde we went first to the pleasant gardens of the Luxembourg, — gardens which always make one envious for London, — and thence to Notre Dame. Here I always feel no slight pride in the success which its architect has achieved. Six hundred years have passed over Paris, one effort after another has been made, vast sums of money have been spent, and still this great work stands supreme and separated by a vast distance from all competition,' and greatest beyond comparison of all Parisian buildings, not only in its general scheme, but equally in the admirable design and execution of every detail. There is much to be seen and learnt here in every way. The west doors are superb. The planning and construction are very fine, and the series of sculptures behind the stalls full of interest and well worthy of study.

From Notre Dame one goes, of course, to the Sainte Chapelle. When this journey was undertaken, everything about this *chef-d'œuvre* was gradually growing to perfection: the fleche was being put up on the roof, the painting on the walls was nearly finished, and the altar was in progress. Since then it has escaped, as it were, by a special Providence (and why not?) from the incendiary fire which destroyed almost the whole of the surrounding Palais de Justice, and it still rises uninjured among the ruins. Of all the chapels of the same kind it is certainly the most beautiful, and whether one names our own St. Stephen's, or thinks of others, such as the Chapel at S. Germer and the other at Riom, the Paris Chapel is certainly by far the finest — being, in truth, a real work of inspired genius.

Altogether, I cannot help thinking that the effect upon the mind of what one sees in Paris is very unsatisfactory; the revival of Christian art seems, as it were, to be only skin-deep; there seems to be no enthusiasm for it. What is done is done in the same way as other public works, as the business of the state, not by the will of the people. The scaffolding, which has just been removed from the avenue leading from the Tuileries to the Barriere de l'Etoile, after having assisted at the fete of Napoleon, was an illustration sufficiently apt of the work which seems to engage too many of the artists of Paris; Parisian fete composers and decorators really appear to be the architects of the day, and of course this fact must militate very much against real art in every branch, as its tendency is to make people accustomed to temporary exhibitions, the shortcomings of which are pardoned on the score of their temporary character; and so the artist is lowered in his tone by assisting in the production of works which are not intended — as all great works ought to be intended — to last for ages.

A day in Paris is generally a long and tiring one — and so we found it; but, nevertheless, we pushed on without delay, and, leaving our hotel before the *table-d'hôte* was much more than half over, we drove to the station of the Strasburg Railway, and in a few minutes we were *en route*. If any one doubts the possibility of really resting one's body in a railway carriage, let him take the same precaution that we took, and he need not despair: a day of sight-seeing in Paris is certainly the best possible recipe for sound sleep in a railway carriage, and I believe that when we arrived at Strasburg, at about eight the next morning, we were very fairly rested. I confess, however, that I did feel a twinge of horror when I found that the train by which we were anxious to reach Basel left again in about half an hour — too long to wait, but long enough for either breakfast or dressing. There seemed, however, to be no alternative, and so on we went, comforting ourselves as best we might with some sour grapes and bad dry bread — the sole edibles procurable at the Strasburg buffet!

The railway from Strasburg to Basel is much more enjoyable than iron-ways generally are. There is scare a cutting during the whole extent of the journey, and the views of the chain of the Vosges are — before one has gazed on real mountains in Switzerland — very delightful.

The railway runs up the broad valley of the Rhine, and within a few miles of Strasburg approaches very near to the mountainous district. The outlines of the hills are bold, picturesque, and well varied; and, as they rise rather precipitously from the valley, are often crowned with ruined castles, and have on their lower slopes large and populous-looking villages; they are at any rate very pleasing neighbors for a railway journey.

A few architectural notes of such churches as are passed on this route (which I travelled not for the first time) will not be out of place, though, with one exception, there is not any thing of great value.

At Schlestadt there is a large tower of great date to the principal church, which is rather fine in its effect. It has its two upper stages nearly similar, which is rarer at home than abroad. Another church has an early spire; and there is a smaller church with a good open turret. Opposite Schlestadt the chain of the Vosges is very striking, and some of the picturesque outlines of hills capped with ruined castles remind one of the more famous banks of the lower portion of the Rhine. Beyond Schlestadt we reach Colmar, the cathedral of which is large, and has a late tower capped with an ugly bulbous roof. Another church in Colmar has a good open-work and very light turret rising from the middle of the length of its roof. The effect of this kind of turret, of which we in England have no examples, is always very satisfactory.

But the best church in the whole extent of this journey is that of Rouffach, on whose merits "Murray" — whose services all travellers must gratefully acknowledge — is silent. It is of early date, cruciform in its plan, and the crossing surmounted by a good early tower and spire of octangular form. Each side of the tower has a good window, above which a string-course forms the base to a gable on each side. The angles of the spire spring from the bases of these eight gables, and the whole design reminded me somewhat of the only example of the same type in England, — the beautiful steeple of Lostwithiel. Rouffach has a good choir terminating in an apse, and a southwestern steeple, surmounted by a slender spire too small for the tower. Altogether, the general effect of the church is very fine. Beyond this point there are no features of interest; the Vosges retreat into the distance, and nothing is to be seen but a dead flat of field and wood, relieved occasionally by a village or town, remarkable mainly for the ugliness of its church. The busy manufacturing town of Mulhausen is passed, the number of stations is carefully reckoned, and long before you catch the first view of Basel you are heartily sick of the slow pace at which the Strasburg & Basel Railway Company always arrange to carry their passengers.

Those who know the Hotel of the Three Kings at Basel will understand how grateful was the information given to us, as we mounted its steps, that the *table-d'hôte* was to be ready in half an hour. Refreshing enough at any time, such an announcement was doubly so to travellers just arrived from a journey from Paris without a stoppage; and in no bad spirit did we enter the *salle à manger*, whose windows, opening into balconies which absolutely overhang the great and glorious Rhine, flowing strong and quick forever in the same unceasing current, make it about the pleasantest room of the kind that I know.

There are few things in the world so fine as a mighty river, few rivers so fine as the Rhine, and few spots so favorable for its contemplation as the balcony at Basel. As you look at the deep color of the water, you think of all the wonders which on its way has been seen. You remember your own exploits and pleasant walks in past times along the lovely valley of the Aar, and over the barren and story waste of the Grimsel, to the source of this beautiful feeder of the Rhine; or you think of Lake Constance and Schaffhausen, and of the beautiful valley of the Upper Rhine, and of the lakes of Wallenstadt, Lucerne, Brienz, and Thun — every one of which seems to the mind's eye to be represented and brought near by each wave that dashes madly along before your gaze. And then, whither do they all so swiftly wend their way? Down by minsters and by castles, along broad plains, through narrow water-worn chasms, and again through great, dreary, but many-peopled flats, into the sea, there to mix themselves and all their recollections in the great, glorious, but tradition-despising depth of Old Ocean.

(TO BE CONTINUED).

COMMUNICATIONS.

THE COMING BRICK.

WHILE brickmaking by the dry process is rapidly taking the precedence for fine front and ornamental facing work, and old fogyism is on the wane, there is still some prejudice against the advanced art right here in the East, which is the home of the hand-made repress brick, which we may justly say was an article of great popularity throughout the country a few years ago, but to-day the trade demands a better brick. The fads and fancies of our ever-progressive architects must be closely followed. Great strength and beauty, and a perfectly true brick of even size, cannot be made by the old process. To a Chicago architect or builder any endorsement of a dry pressed brick is unnecessary. Here, hundreds and thousands of magnificent towering structures testify to their superiority and great worth, and the doubt that once existed while the process was in its infancy, and the brick experimental, has been entirely dispelled by the perfection of their manufacture. It is the experimental dry pressed brick that has retarded the complete eradication of the old-time method for fine fronts. Had semi-dry brickmakers been complete masters of the process at its infancy, or if they all thoroughly understood the process to-day, the old method would very rapidly become a thing of the past where nice work is desired. We all know that a poorly made dry clay brick is worthless, and, were it not for the fact that the manufacturer of the same in his desire to get his goods on the market, and some return for the usually heavy outlay, we would never have had the criticism we are to-day subjected to. Architects, contractors, and builders everywhere that have thoroughly tested the merits of dry pressed brick manufactured by those who *are out of the experimental ruts* will in every instance endorse and stand by the dry pressed brick, because for great strength, fine texture, perfectly formed edges and corners, they have no equal. For beauty and finish they are unexcelled. They will cut and lay better. They are more dense and there is more clay to the brick, and in conclusion I will emphatically say that they are the coming brick for all facing walls as well as high-grade and artistic structures where the most magnificent architectural effect is desired.

E. A. S.

PHILADELPHIA, Jan. 4, 1894.

A CORRECTION.

UNIVERSITY OF PENNSYLVANIA, PHILADELPHIA.

EDITOR OF THE BRICKBUILDER.

Sir, — Referring to the news item in your issue of August regarding Philadelphia educational facilities in architecture, I notice that "there is danger that the same over-attention to mechanical, mathematical, and scientific studies that once characterized the Institute of Technology course will prevail at the University of Pennsylvania." It is further intimated that the school of architecture is laboring under disadvantages similar to those which hampered the department of architecture at the Institute of Technology for so many years.

Inasmuch as these are errors involving the fundamental ideas upon which the instruction in the school of architecture is based, a correction seems in place. The "danger" referred to has never had existence in the school since Prof. Laird was placed in charge in the fall of 1891.

The general policy of the school is determined by a faculty of architects whose æsthetic abilities are recognized from New York to California, and "professors who persist in considering architecture an industrial science" have no place nor part in it. The position of the school is unique, inasmuch as all technical instruction is given by architects, — a policy which requires nine instructors to carry it out.

The æsthetics are not given a subordinate place, as your item would intimate. The evidence of this may be found in the catalogue of the university, where it will be seen that 1,290 hours are given to architectural design out of a total of about 4,170 hours for the entire four-year course. Aside from this are 1,140 hours given to free-hand drawing, water-color, pen and ink, and modelling.

Respectfully yours, JULIAN MILLARD,

Instructor in Architecture, School of Architecture, University of Pennsylvania.

THE NATIONAL ASSOCIATION OF BUILDERS.

TO MEMBERS OF ALL FILIAL BODIES: — The Eighth Convention of the National Association of Builders, which is to be held in Boston in February, beginning on the second Tuesday, will be a peculiarly interesting event in the history of the organization. The coming meeting will bring the Association back to the place of its birth, and will be the occasion of the introduction of several original features in the conduct of the convention as well as in the entertainment extended to delegates and visitors. The opportunity afforded the delegates and others to visit the Master Builders' Association of Boston, which has so often been referred to as an example of what a Builders' Exchange ought to be, and the arrangements in preparation by that association for the entertainment of its guests, it is hoped, will result in many benefits in the conduct of other filial bodies of the National Association, and in the fostering of the feeling of fraternity among the builders of the country.

The return of the National Association to its birthplace is a peculiarly fitting time for renewing old associations and establishing new ones, and in pursuance of this belief it is the purpose of the Master Builders' Association of Boston to invite the attendance as visitors of all those who have attended any of the previous conventions as delegates, whether the organizations to which they belong are at present members of the national body or not, and also to urge such new exchanges as have recently become established to send some representation to the meeting. This will insure the appearance of many familiar faces among the visitors, and will greatly add to the sense of fellowship, which is so desirable to maintain. The presence of visitors from newly organized exchanges is appropriate at this time, as it may be taken for granted that the National Association starts out on a new cycle of action with the approaching meeting, and new exchanges will receive great benefit and impulse from personal contact with the National Association and its work.

Boston offers many inducements to the visitor, with its places of historic interest, together with objects and buildings which picture vividly the old Colonial times and the incidents of the Revolution. Ample provision will be made for the delegates and others to visit every or any place of interest in the city and vicinity without interference with the work of the convention.

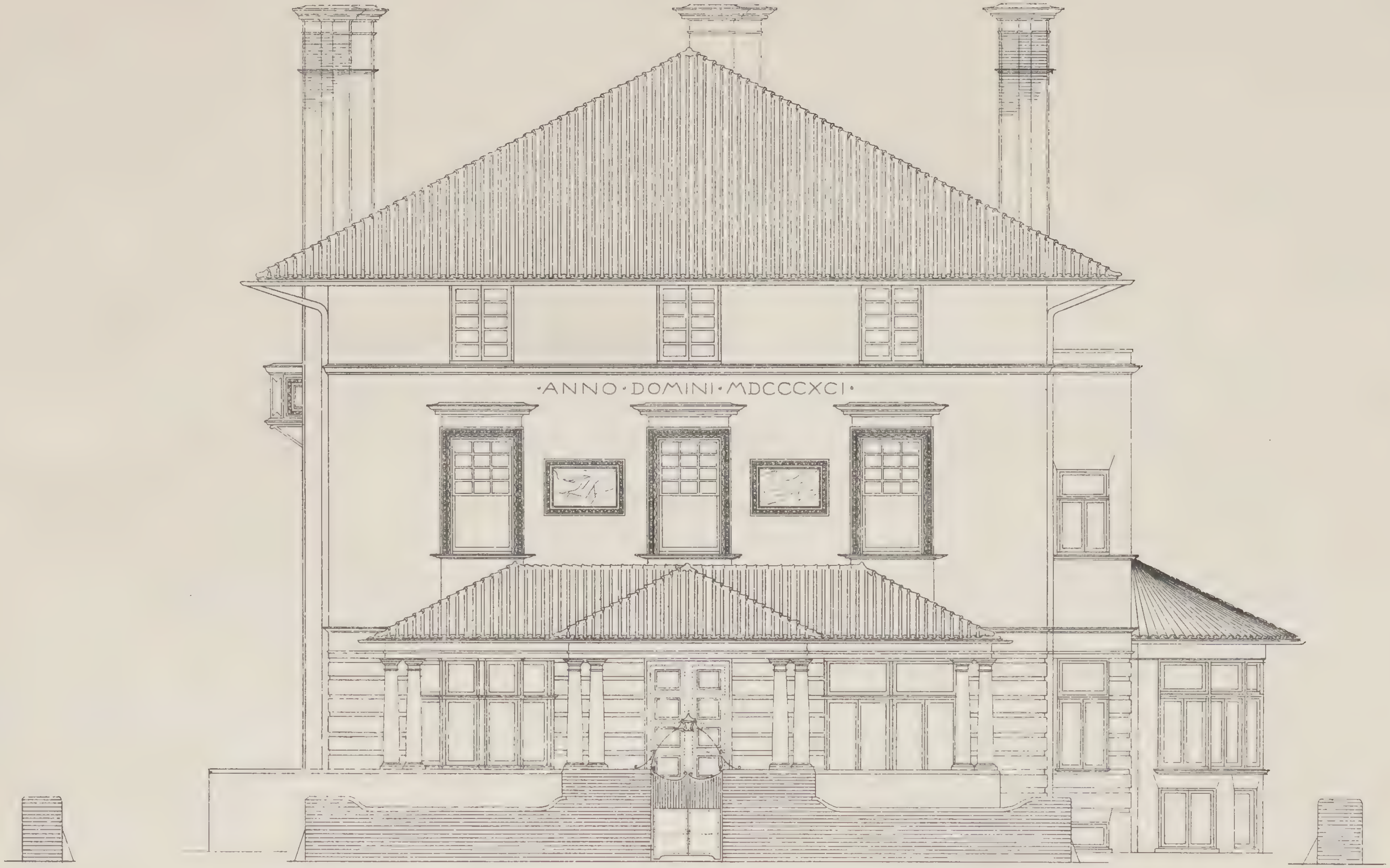
The usual circulars in reference to the convention, covering matters of transportation, hotel accommodation, official programme, etc., will be issued in due season.

The Executive Committee beg that, if members of filial bodies have any subjects, questions, or matters which they desire to have considered by the National Association, they at once communicate them to their officers, in order that they may be forwarded to the national officers and be arranged for in the programme.

Issued by order of the Executive Committee.

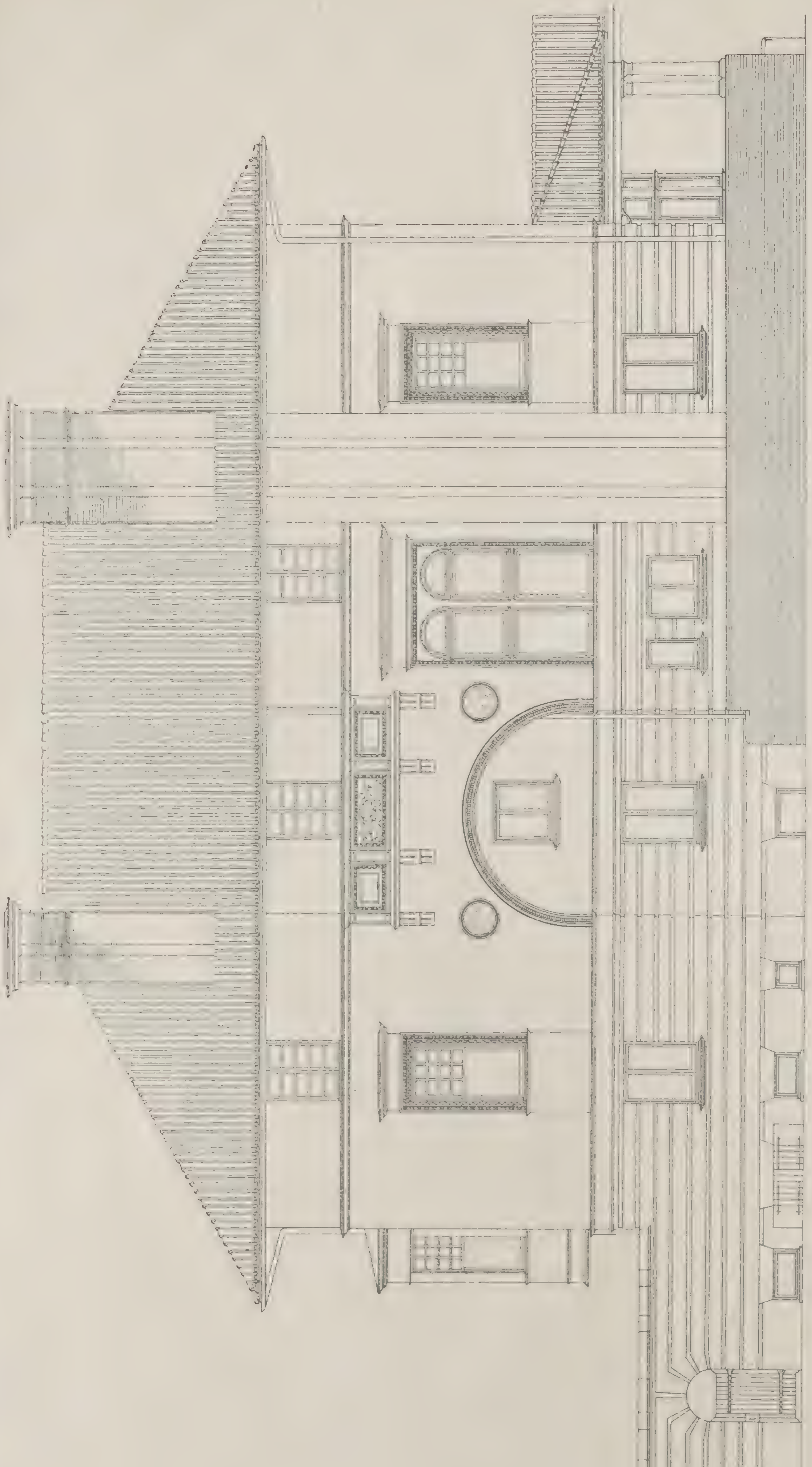
WM. H. SAYWARD, *Secretary.*

OFFICE OF THE SECRETARY, 166 DEVONSHIRE STREET, BOSTON, MASS.

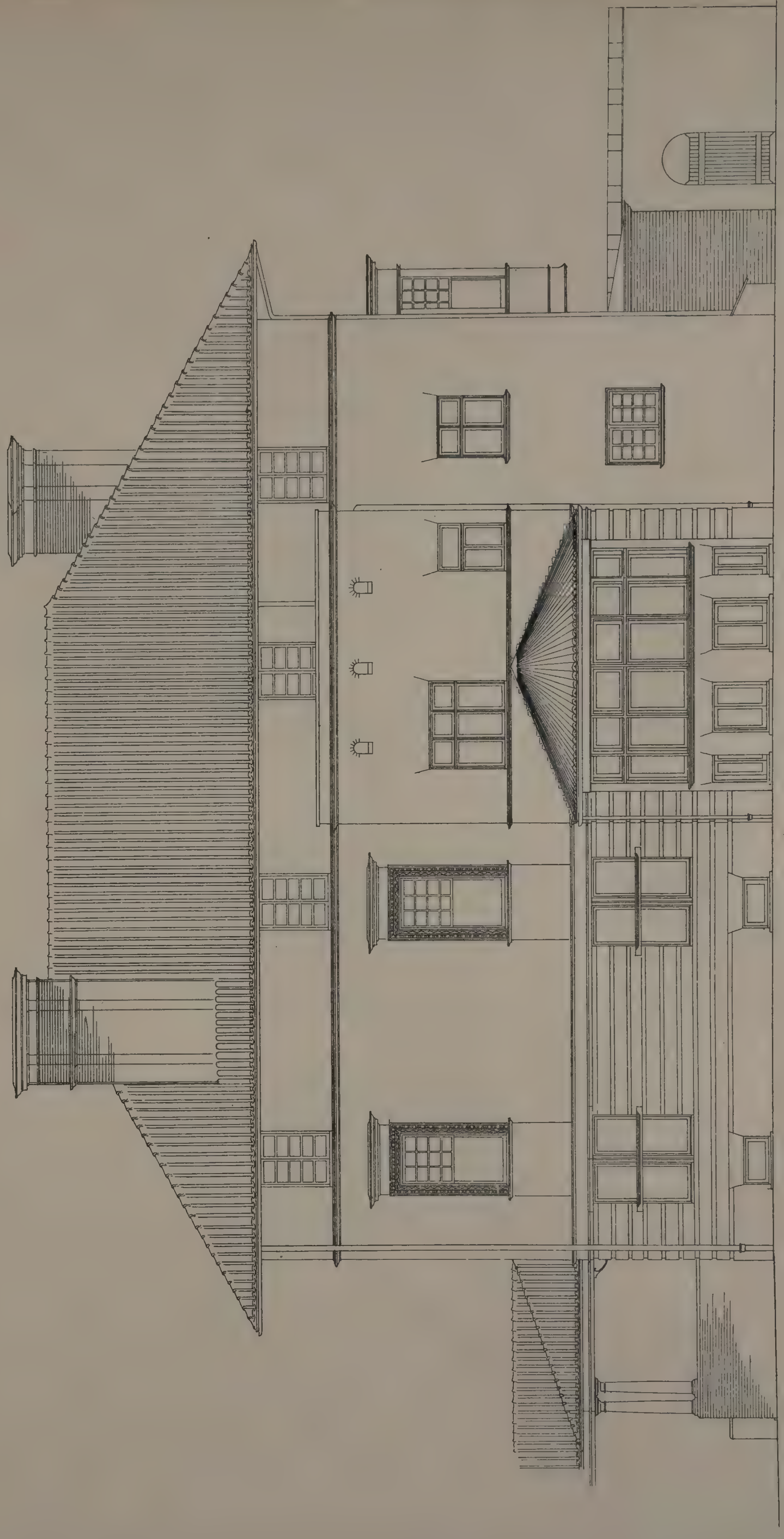


HOUSE FOR HENRY COCHRAN, ESQ., PHILADELPHIA; BARING STREET ELEVATION.

WILSON EYRE, Jr., ARCHITECT, PHILADELPHIA.

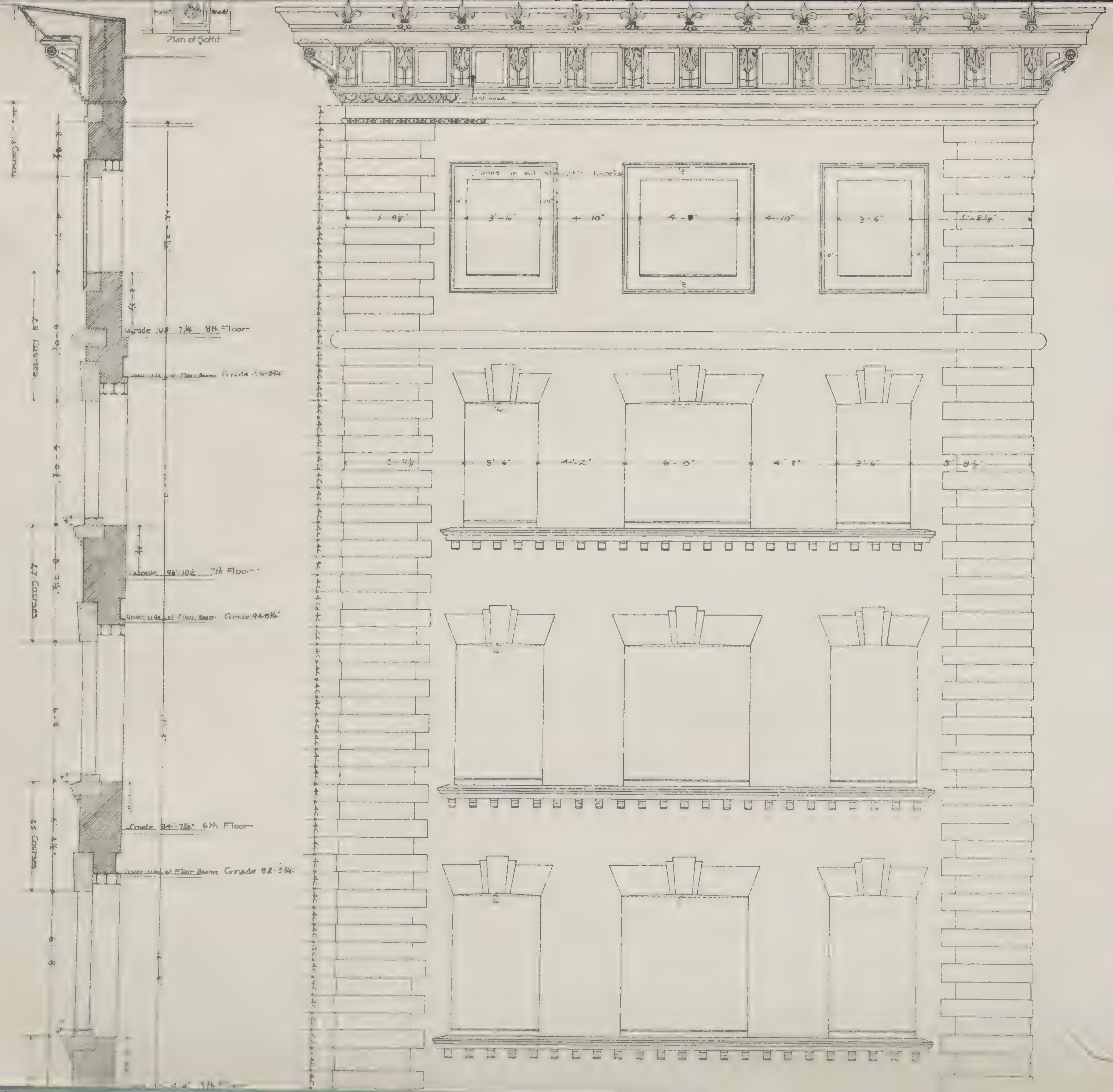


HOUSE FOR HENRY COCHRAN, ESQ., PHILADELPHIA; 36TH STREET ELEVATION.



HOUSE FOR HENRY COCHRAN, ESQ., PHILADELPHIA; EAST ELEVATION.

WILSON EYRE, JR., ARCHITECT, PHILADELPHIA.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3'-6"
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Under side of Floor Beams Grade 106-5¾"
Grade 96'-10½" 7th Floor
Under side of Floor Beams Grade 94-8¾"
Grade 84'-7¼" 6th Floor
Under side of Floor Beams Grade 82-5¾.
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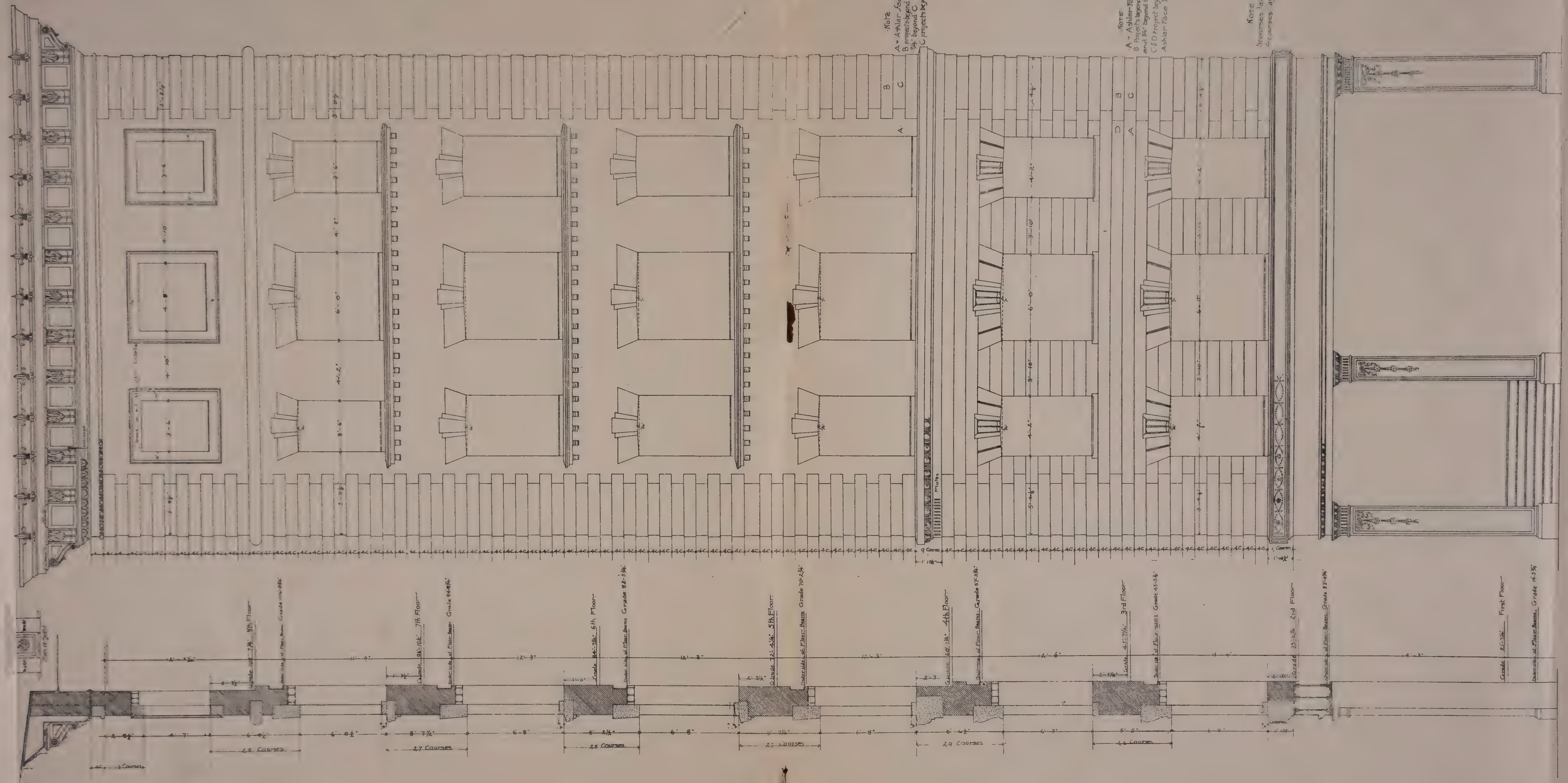
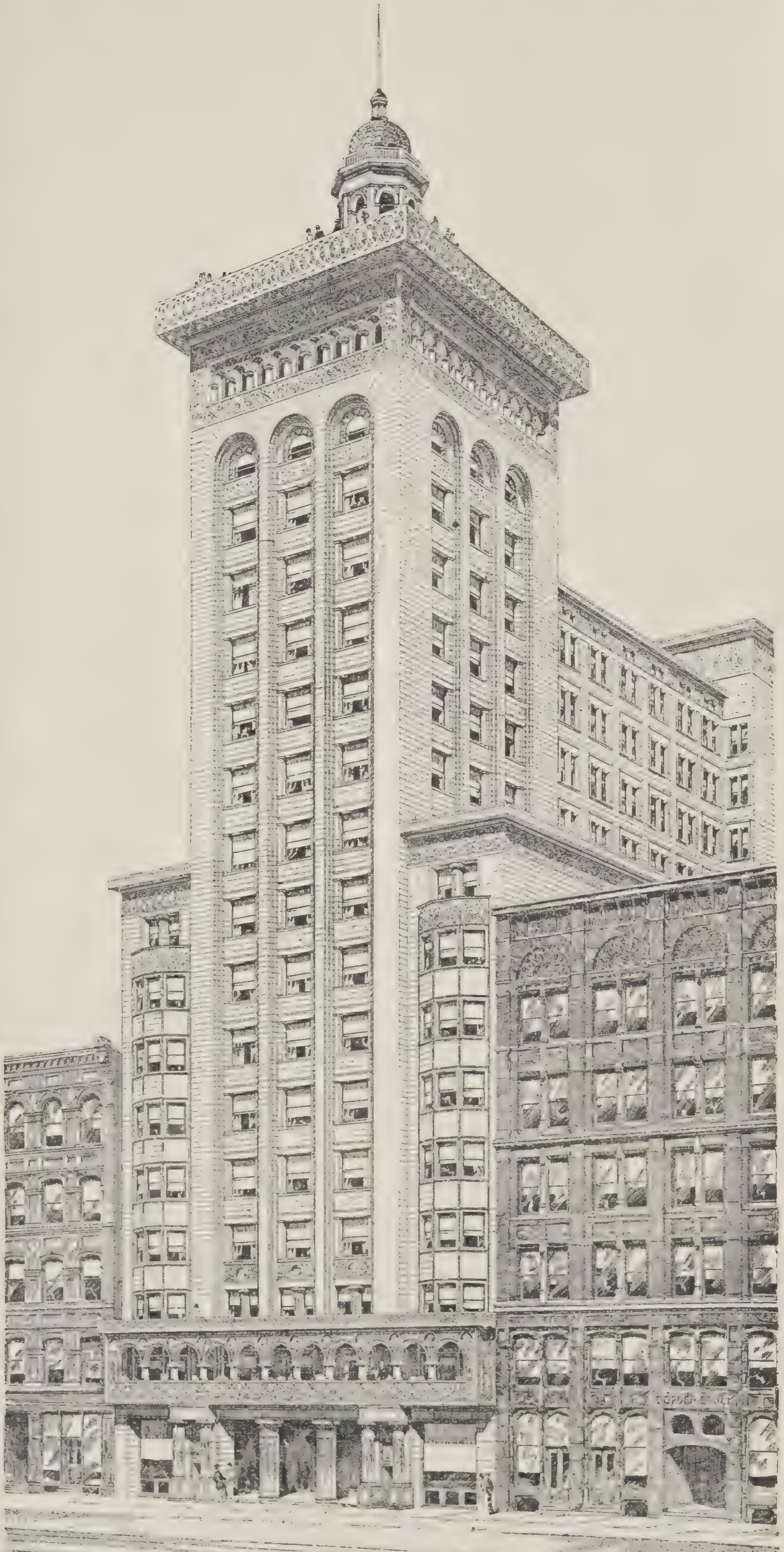


BUILDING FOR THE U. S. HOTEL COMPANY, BOSTON; ELEVATION ON LINCOLN STREET.

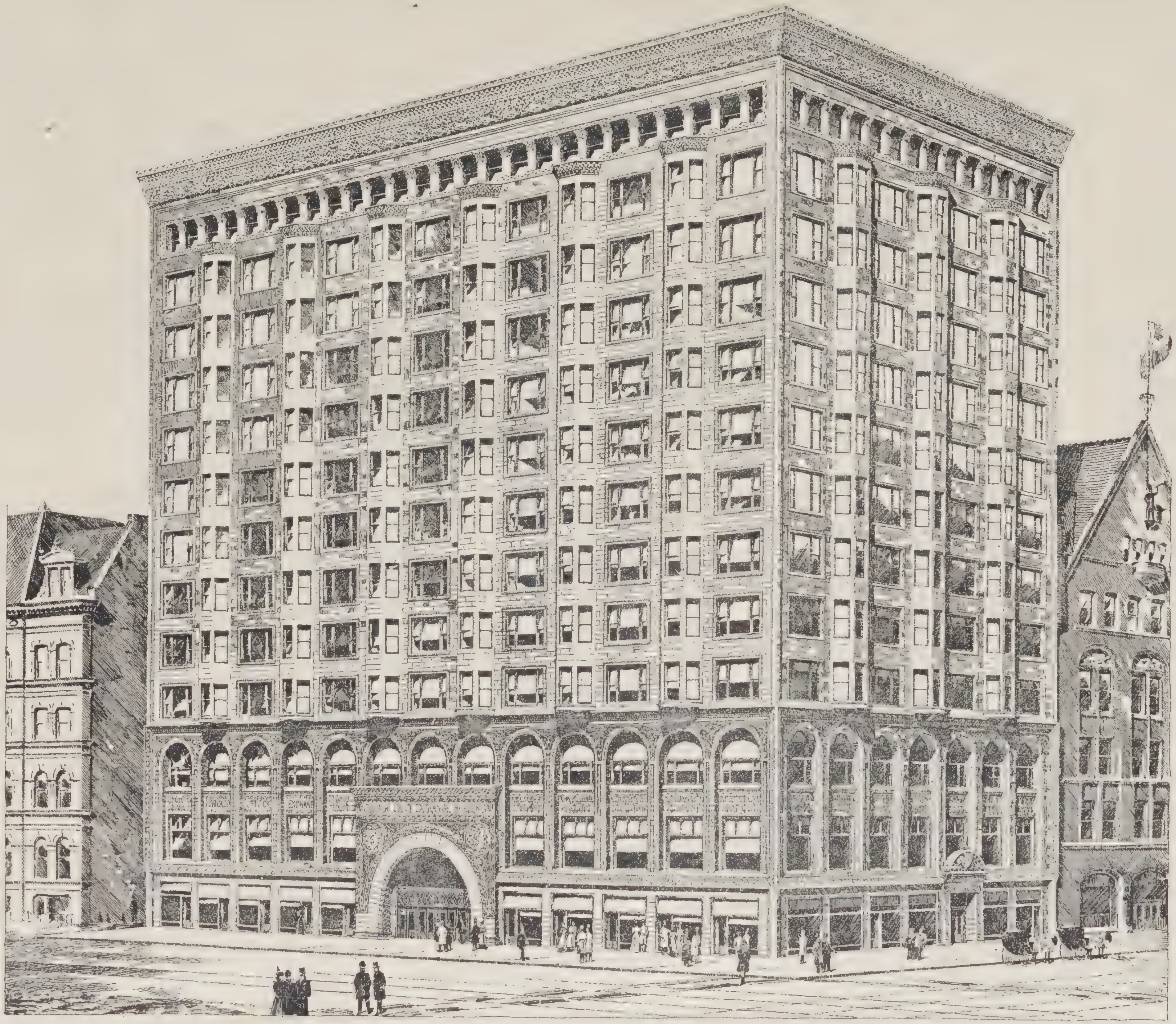
WINSLOW & WETHERELL, ARCHITECTS, BOSTON.



THE SCHILLER THEATRE, CHICAGO.

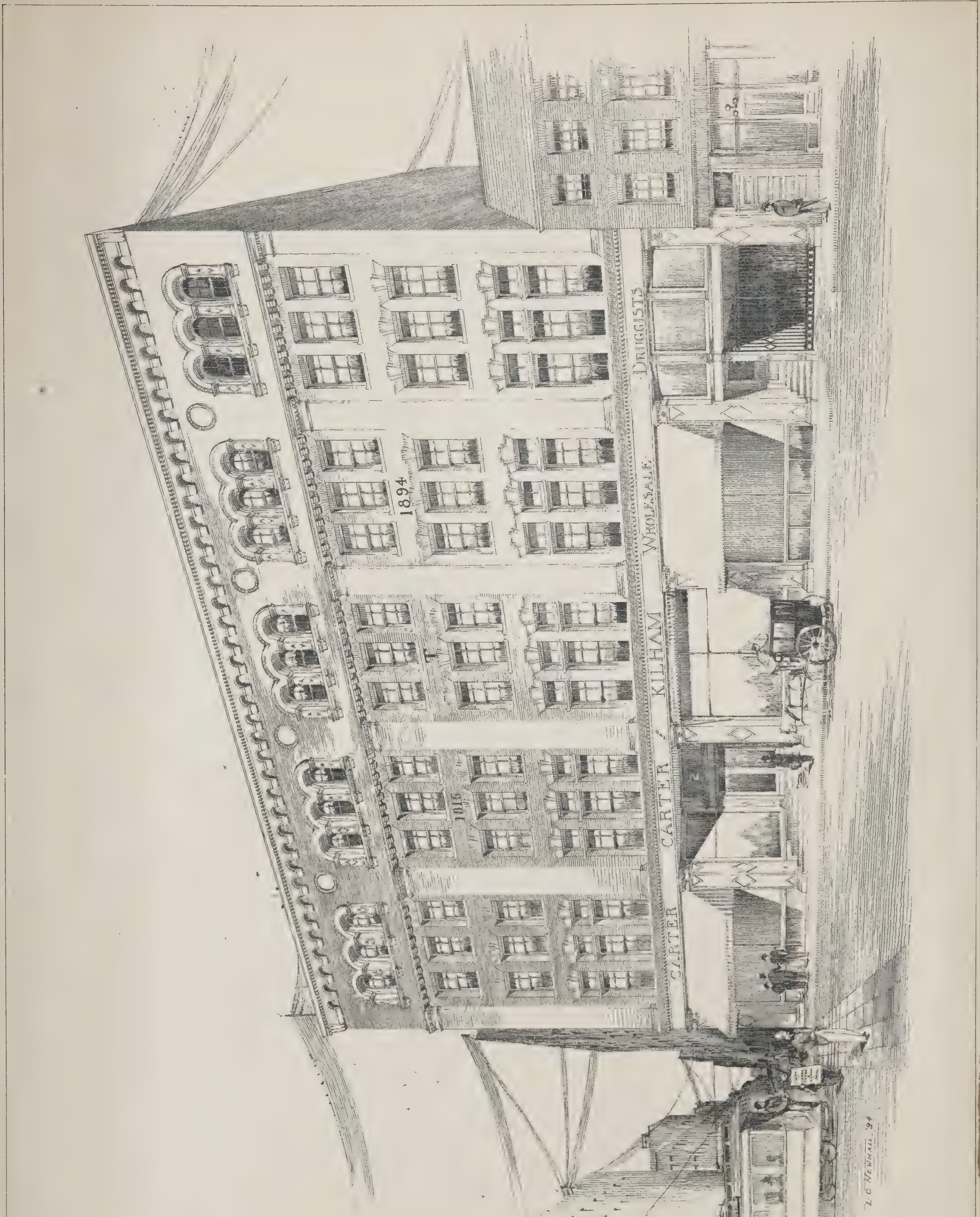
ADLER & SULLIVAN, ARCHITECTS.

See article on Steel and Terra Cotta Buildings in Chicago.



CHICAGO STOCK EXCHANGE BUILDING.

ADLER & SULLIVAN, ARCHITECTS.
See article on [illegible] and Terra Cotta Buildings in Chicago.



STORE BUILDING FOR CARTER, CARTER & KILHAM, BOSTON.

THE BRICKBUILDER.

AN ILLUSTRATED MONTHLY DEVOTED TO THE ADVANCEMENT OF ARCHITECTURE IN MATERIALS OF CLAY.

PUBLISHED BY

The Brickbuilder Publishing Company,

Cushing Building, 85 Water Street, Boston.
P. O. BOX, 3282.

Subscription price, mailed flat to subscribers in the United States and Canada	$2.50 per year
Single numbers	25 cents
To countries in the Postal Union	$3.00 per year

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Entered at the Boston, Mass., Post Office as Second Class Mail Matter, March 12, 1892.

THE BRICKBUILDER is for sale by all Newsdealers in the United States and Canada. Trade Supplied by the American News Co. and its branches.

PUBLISHERS' STATEMENT.

No person, firm, or corporation, interested directly or indirectly in the production or sale of building materials of any sort, has any connection, editorial or proprietary, with this publication.

WITH this issue The Brickbuilder enters upon the third year of its existence, with the brightest of futures ahead. With material in the way of both text and illustrations in hand to insure its being one of the most valuable papers in a purely architectural way, it will, during the year work up special departments connected with the materials it represents, that will make it invaluable as a trade journal. There will be a steady growth in size from number to number as new features are worked up, and we can promise by next December a publication at least three times the size of the December, 1893, issue.

We recognize fully that the only legitimate basis for such a periodical is a large paid circulation, and the surest way to gain this is to give subscribers full value for their money.

From number to number our advertising patronage is increasing, and we recommend our readers to examine this part of the paper as regularly as they do the text and illustrations. In no publication can they find more full and complete information concerning bricks, terra-cotta, fire-proofing, cements, mortar colors, etc., than in the advertising columns of The Brickbuilder. In the line of manufacturing processes, machinery, dryers, kilns, and brickyard supplies they will find a constantly increasing fund of information of a practical and up-to-date nature. We call especial attention to this, as it is through its advertising columns that a special publication like The Brickbuilder is often of greatest service to its readers.

MANUFACTURERS of ornamental brick who enter the market without a good stock of *all* shapes they catalogue and facilities for replenishing their stock as quickly as a brick can possibly be made and burned, can hardly hope, even with everything else satisfactory, to hold the patronage of architects. How often we see a building hung up for two or three bricks, which are being made! It will not do for a manufacturer to take an order, as we have definite knowledge has been done, relying upon the substitution, when the time came, of some other shape for the specified one, which was not in stock and which it would be a trouble to make. Architects do not specify ornamental bricks by catalogue numbers, with any other purpose than to have those bricks and none others used, and substitution by the maker is the surest way to prevent them from again specifying his bricks. This does not apply to all makers, but the fact that it does apply to *some* is sufficient reason for comment here.

IT is also worth while to say a word in criticism of the position of some manufacturers, — of bull-headed independence of the architectural profession. An instance not long ago came to our attention where the manufacturer remarked that he did not care for architects; that he *made* them use his brick, by going directly to the client and through him forcing the specification of his bricks upon the architect. Too many material men hold this view, but investigation frequently shows some weak spot in their goods which the architect has been quick to discover. It is the almost universal opinion among manufacturers of really meritorious articles that the architectural profession is composed of gentlemen; that they are honorable and courteous in their intercourse with the building trades; that, while protecting their clients' interests, they are always ready to recognize the rights of the other side. It is the man who starts in without experience to introduce a new appliance, on which he allows the architects a commission, who speedily draws his own conclusions that they are all "owned" by some one else who has got in ahead of him.

The manufacturer of fine grades of brick, and especially of ornamental brick, *cannot* ignore the architect. He may get up very fine stock designs of mantels, etc., but there is a very limited field for such work. To compete at all in ornamental work with the terra-cotta manufacturers, he must place himself as much in accord as possible with the architects.

THERE is a subject which we would like to see the leading manufacturers of ornamental brick take into consideration, and that is a series of really useful patterns of moulded and ornamental bricks which should be the common property of all manufacturers, and for which all the machine men would make moulds, after one standard mould, which would be cared for by the secretary of the National Brick Manufacturers' Association. Many of the existing patterns we find catalogued are, as we have often said before, utterly unsuited to good architectural work. It would be possible, through the appointment of proper committees by the American Institute of Architects and the National Brick Manufacturers' Association, to arrange for a competition in the design of a series of patterns, into which good designers would enter, and which would probably result in the adoption of a complete series of ornamental bricks which architects would find of constant use. These shapes being numbered the same, whoever manufactured them and carried in stock by all the leading companies, would lead architects to a greater use of moulded bricks. This would be the natural result of simplifying the category of shapes, on the one hand, and giving a series, all of which would be useful in some way; whereas, every catalogue at the present time contains many patterns that are practically useless in good designing. In place of a dozen large catalogues, all of which have some shapes in common, there would be one catalogue and one nomenclature. Any manufacturer could supply the bricks, and there would be no danger of any job being "hung up" while stock was being made. Furthermore, while the bricks of different manufacturers now vary in size, there would be in such a series a standard which could be depended on. In designing good ornamental brickwork it is exceedingly important to know the exact dimensions of the bricks. A difference of one eighth of an inch will, when repeated across a façade, throw out a whole design.

The above remarks are merely offered as suggestions. We wish our readers, both architects and manufacturers, would favor us with "open letters." If the general tenor of these is favorable, we will take steps to get the matter into some definite shape for properly presenting to the Institute and to the National Association.

IT is peculiar how certain traditions hang on in different localities, even after some venturesome spirit has braved them and shown them to be utterly without foundation. No one but the terra-cotta manufacturer knows how hard has been the fight against the bugbear of American climate. To be sure, the first terra-cotta brought here from England was unsatisfactory, and the first attempts at American manufacture were no better; but after the successes which have attended the manufacture of terra-cotta and ornamental brick, it seems strange that architects should still say: "It may be very well somewhere else, but it will not stand *this climate*." Now, *this climate* covers every possible climatic condition; for the objection crops out in every part of the country, though it is now mostly confined to the smaller cities. It is safe to say that the materials now turned out by the leading manufacturers will stand any climate to be found in the United States, and for the present that is all that need concern us. We hope any reader who takes exception to this statement will correct us, but we want a correction backed up by actual facts and not theory. The subject was suggested by the remark of an architect who had a committee, in a city some two hundred miles from Boston, to deal with, and found them obstinate in their opinion that ornamental brick and terra-cotta would *not* endure their climate. Brick and terra-cotta were used nevertheless.

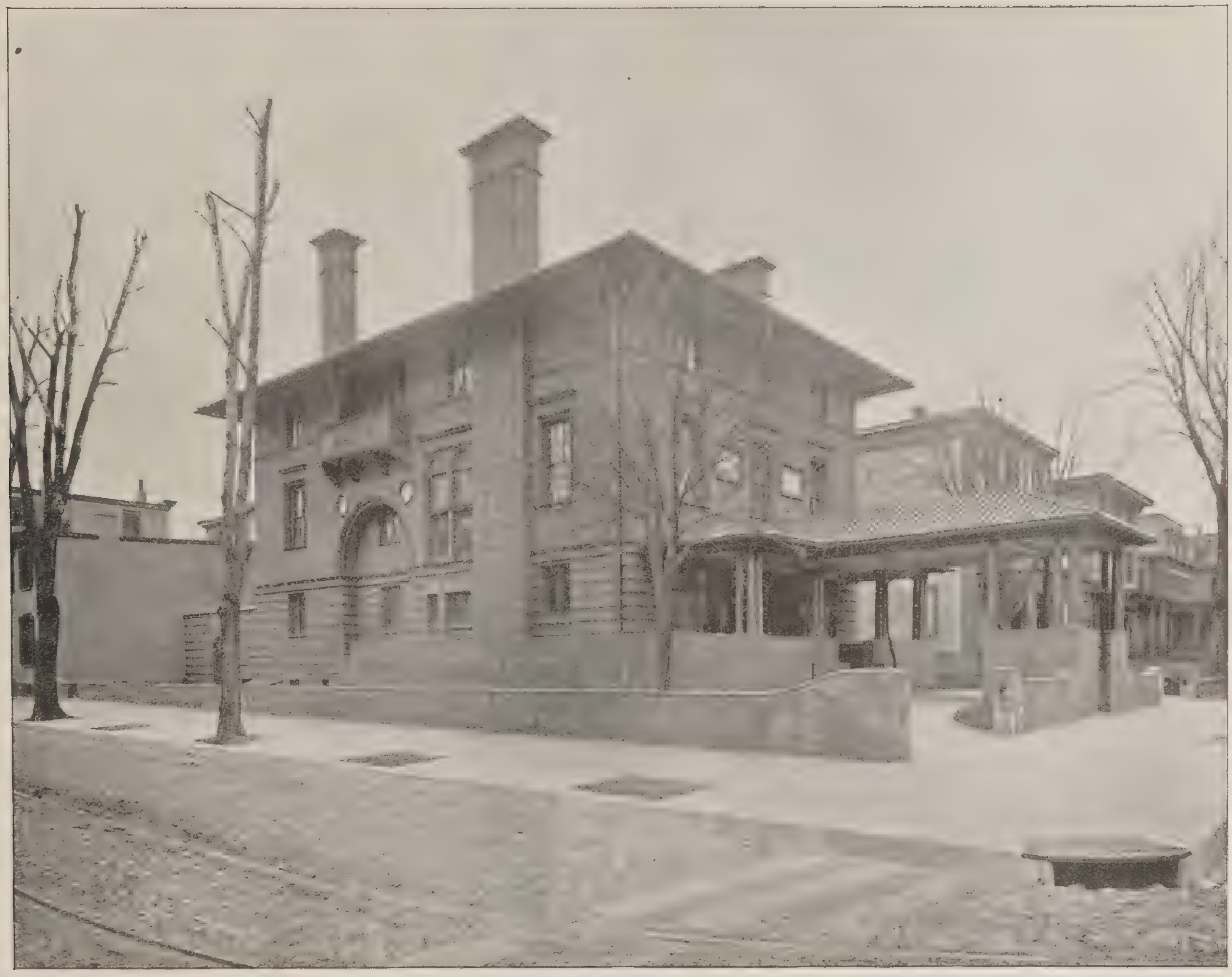
CONSIDERING what has appeared in previous issues of THE BRICKBUILDER concerning the use of hollow terra-cotta blocks for some styles of building, we take pleasure in announcing the early publication of photographs and detail drawings of the very interesting residence which Mr. W. D. Gates, President of the American Terra-Cotta and Ceramic Company, has recently erected at Hinsdale, Ill., from designs by Messrs. Jenney & Mundie. Large photographic reproductions appear in this month's *Clayworker*, and with customary generosity the publishers of that paper have placed them at our disposal. Mr. Gates is, in the first place, a thorough believer in terra-cotta, and having the facilities of a large and successful terra-cotta plant, and the services of Mr. Jenney, who is one of the pioneers in the use of terra-cotta, he went boldly into an experiment that in less enthusiastic hands would have stood an excellent chance for failure.

THE manufacture of hollow terra-cotta blocks in other forms than the commonly known fireproofing is receiving considerable of a stimulus, and the Frey-Sheckler Company of Bucyrus, O., is already making special machinery for this class of clay products. We cannot understand why they should produce dies for so-called "rock-face" work. We have put ourselves thoroughly on record before this, but let us say again, and as often as seems necessary, that clay is too good, too noble a building material to debase it by casting it in imitation of a material it excels in every point. Use it naturally, but don't try to make it represent stone, and above all crudely dressed stone. We are more inclined to criticise this special phase of the Frey-Sheckler Company's new enterprise on account of the high position these machinery makers hold, and the danger that a bad idea, such as we consider the "rock-face" design to be, will be imitated by smaller manufacturers, as well as the good ideas that emanate from their factory.

OUR February number will have so much space taken up by papers read at the National Brickmakers' Association at Chicago this month, and the report of the annual convention of the National Association of Builders held in Boston, Feb. 13 to 16, that the first instalment of our translation of Choisy's "L'Art de Bâtir chez les Romains" will have to be held over until the March number. The February number will contain elevations and details of the Volta Bureau at Washington, by Peabody & Stearns, and the Eureka Club at Rochester, by Nolan, Nolan & Stern.

THE coming eighth annual convention of the National Association of Builders, to be held in Boston, Feb. 13 to 16 inclusive, promises to be one of the most successful in the history of the Association. The Boston Exchange, which is one of the very strongest in the country, is making every endeavor to render the convention not only profitable to the Association, but very pleasant to the visitors. Ample headquarters have been secured at Parker's, which connects by several lines of cars with the convention hall in Mechanics' Building. Among the important features will be Mayor Matthews' address of welcome on Tuesday morning; the discussion on Wednesday morning of reports from filial bodies, with the object of securing suggestions which will lead to improvements in the administration of exchanges and the more effective carrying out of the recommendations of the National Association; the address Wednesday afternoon by Hon. Carroll D. Wright, on "The Relations of Employer and Workman," followed by discussion; the consideration of the Uniform Contract on Friday morning; and the election of officers Friday afternoon. Thursday will be an intermission to allow of committee work, and excursions of members to places of interest. A reception and smoker will be tendered visitors on the evening of the closing day. All details as to entertainment committees, reduced rates of transportation, etc., have been looked after, and without something unforeseen happens the business of the convention will pass off without a hitch. Those visitors who wish to have special headquarters while here are cordially invited to make use of the facilities at our office at 85 Water Street, where they can have stenographer's service, and the prompt and safe handling of their mail.

PEOPLE who know least about a matter of public interest rush the quickest into print concerning it. Two subjects have brought out more than the customary number of senseless letters to the Boston papers. They are the proposed Tremont Street subway and the new Music Hall. To the majority of Boston architects, the out and out appointment of Messrs. McKim, Mead & White is vastly more satisfactory than a competition would be; and it is safe to say that this appointment is endorsed by every architect who could be seriously considered in connection with the matter. But now come correspondents by the dozen who



RESIDENCE OF MR. HENRY COCHRAN, PHILADELPHIA. WILSON EYRE, JR., ARCHITECT.

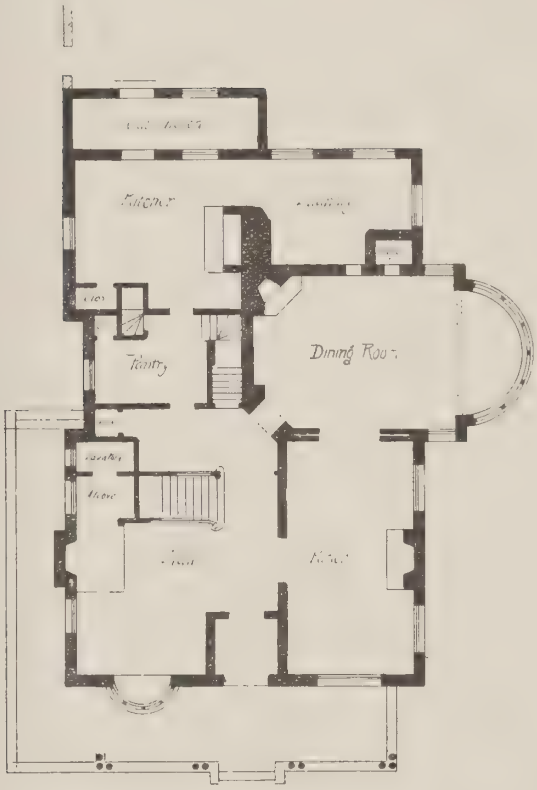
SEE PLATES 1, 2, AND 3, AND PLAN AND DESCRIPTION ON FOLLOWING PAGE.

assume that the question of proper lighting will not be considered, and take the columns of the *Transcript* or *Herald* to advise the architects in this particular, or it may be that the acoustic properties necessary to a music hall must be explained by laymen, or no provision is to be made for properly ventilating the building. These letters are intensely tiresome to all but a certain class who seem to be possessed with the idea that architects do nothing but impracticable work.

Now comes a croaker who sees an immence boom in the undertaking business due to the deaths from pneumonia the subway will cause. He evidently has not read a word of the full descriptions the promoters of the subway have published, in every one of which special emphasis was placed upon the fact that this subway was not to be a cold, gloomy, cavernous tunnel, but a carefully and attractively built underground arcade, the whole success of which depends upon its being a relief from the scorching sun in summer, and from the cold of winter. The ideal of the subway projectors is a brilliant arcaded promenade opening into the basements of stores, on one side.

The lining of this arcade would be glazed or enamelled terra-cotta. The street above could be built over it on the present fire-proofing principle of steel girders and flat terra-cotta arches with an asphalt or brick pavement. The only objection we can see is the noise of the cars in such a subway. But this objection is based upon the present appliances. Let there be a decided necessity for silently running cars and the large electric companies will prove equal to the emergency. Finally, let it be remembered that the subway is in the hands of a committee of exceptionally able men, who are sure to see more obstacles to overcome than the average newspaper reader.

WE wish to call the attention of our readers to a request we have often made for correspondents in every city and town in the United States, and request their coöperation in bringing this to the notice of "go-ahead" young men who may fill such a position. There are many ways in which a correspondent can be useful to the paper, and these are set forth in detail in our letter of instruction, which will be sent upon receipt of a self-addressed stamped envelop; the remuneration for this work is such that a young man who keeps posted on building matters in his locality can make during the year a good thing out of it without special labor. Beyond the simple correspondent's work there is much that he can do, if he so chooses, that will add to his income. Only those who are willing to keep their eyes wide open are wanted.



PLAN OF HOUSE FOR HENRY COCHRAN.

THE residence of Mr. Henry Cochran, in Philadelphia, of which we publish a photograph on the preceding page and three elevations on plates 1, 2, and 3, was designed by Mr. Wilson Eyre, Jr. The building is built of mottled brick and terra-cotta furnished by the Perth Amboy Terra-Cotta Company. The roofing tile is a dull glazed red, furnished by the Lindemann Company of Baltimore. Jacob Myers, 13th and Locust Streets, Philadelphia, was the builder, and Samuel Moore, 1220 Filbert Street, took the bricklaying contract. The first floor plan is given here.

MR. J. C. N. Guibert of New York, manufacturer of the swinging hose rack, writing with reference to the fireproofing department of our paper, says: —

"Personally, my idea is that no matter how fireproof the building may be, in the majority of cases the contents are of an inflammable nature, and that no building, even in the line of private residences, should be without interior water pipe and hose service. I do not go so far as to say that the Swinging Hose Rack must be used in that connection, but I do claim that when hose is used it should be in a condition to be put immediately into service, and that the Swinging Hose Rack is the best device for this purpose in the market to-day."

DON'T forget that THE BRICKBUILDER OFFICE is moved into the Cushing Building, 85 Water Street. Our postoffice box remains the same, — 3282.

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OUR FIRE LOSS.

WHAT IT MEANS AND HOW TO REDUCE IT.

DURING the financial depression in this country that has marked this year, and created distress in many quarters from the suspension of important enterprises, including numerous manufactories, all sorts of reasons have been given for this unfortunate state of affairs. The silver bill received its full share of anathemas as its repeal was delayed from month to month, and the settlement of that question was regarded as the source of inspiration which should shake off the lethargy that seemed to have possessed the business interests of the country. The repeal was effected, but the happy results so confidently expected have not been realized. A new difficulty stands in the way. The everlasting tariff question now arises to interest statesmen, to amuse loquacious politicians, and to plague the people.

There is reason enough to lament the existence of these causes of stagnation in business, and that the best minds in the country should arouse to a deep study of the laws of political economy and of the whole question, "What shall be done to bring our great country, with all its magnificent possibilities, to a permanent condition of prosperity?"

In the midst of all the discussions of this question by the press and public speakers, almost no suggestion has been made that the fearful fire waste of the past few years has had anything to do with the financial depression. When we consider what this fire loss has amounted to in the last decade, we may well raise the question whether the public attention should not be emphatically called to the destructions of millions of property during each year, as a drain upon its resources which, of itself, would in a series of years create a financial panic.

Gradually the annual fire loss of the country has increased from $100,000,000 to an estimated $160,000,000 for this year. No other people on the face of the earth, it would seem, would regard this fact with indifference. No other people could bear the drain on their resources.

It is not to be assumed that the people of the United States are careless in their habits beyond those of all other countries. It is true they are open to severe criticism in that matter, but the construction of buildings that have been erected during the past twenty-five years has been of so inflammable a character, that the loss to which we have referred has followed as a natural consequence.

This fearful waste of property will continue until, under building laws passed by our cities and towns, the further erection of fire traps (so called) is prevented. Cheapness of construction has entered into the calculation of contractors and of those who have furnished the means for constructing buildings, until, considering the prosperity of our country, a shameful state of affairs exists in this particular.

The principles of fireproof construction are well understood, and nothing but false ideas of economy have prevented their being adopted in the past.

The particularly weak point in buildings has consisted in the concealed spaces existing between floors and in partitions, not only in manufacturing establishments, but in commercial buildings, and, worst of all, in dwelling-houses. The production of any material that can be used for partitions and walls, giving proper ventilating spaces, and at moderate cost as compared with that of sheathing or lath and plaster, will be of immense importance in lessening the spread of fires.

The advantages of mill construction (so called) in manufacturing and in mercantile buildings are already appreciated, and, in many of our leading cities, buildings are being erected containing that feature. This does away with spaces between floors, and also, by leaving the side walls bare, relieves buildings of dangers by fire formerly existing in them.

In other structures where partitions are necessary, fireproof materials can be used, and so covered as to afford ornamental surface. Facilities can be afforded the architect for ornamenting the interior of rooms fully equal to those in the old forms of building. Even in dwelling-houses it is believed that the dangers of concealed spaces can be readily avoided by the adoption of mill construction, — the heavy timbers, which necessarily would show in rooms, being treated as cornices, — and by introducing partitions made of fireproof material. Dangers hitherto experienced from hot-air pipes may be entirely avoided, there being no space for fire, should it take from an overheated pipe to extend unseen, endangering the entire premises. Already advantages have been derived from the use of wire lathing in the place of wood, hitherto universally in use, and a plan for using iron sheets, cut in such a manner as to afford clinchers for plastering, has been brought into notice as a substitute for other partitions. The fragile nature of this invention strikes one at first thought, and however it may come into notice, it would seem that some form of brick-work, like that of terra-cotta which is now is use, would be preferable.

From the fire insurance point of view, too much importance cannot be laid upon this revolution in methods of building. It is believed that, with the doing away of the chance for fire to extend from one floor to another, — from one part of a building to another, — more than half the loss by fire would be saved. That being the case, whoever shall aid in bringing about so important an achievement should deserve the heartiest support of the public.

55 Kilby Street, Boston. B. B. WHITTEMORE,
General Agent, Ætna Insurance Company.

TOWER FIRE ESCAPES.

THE subject of safe means of escape from burning buildings is of grave importance.

During the last decade it has been the theme of much thought and discussion, and many plans have been devised for exit of persons from buildings on fire.

The act of Assembly, of the State of Pennsylvania, approved June 3, 1885, requires that all the following-described buildings shall be provided with safe external means of escape: —

"Every building used as a seminary, college, academy, hospital, asylum, or hotel, for the accommodation of the public; every storehouse, factory, manufactory, or workshop of any kind, in which employees or operatives are usually employed at work in the third or any higher story; every tenement house or building in which rooms or floors are usually let to lodges or families; every public hall or place of amusement; every parochial, or public school building, when any of such buildings are three or more stories in height, shall be provided with a permanent, safe, external means of escape therefrom, in case of fire, independent of all internal stairways.

"Such escapes to consist of outside, open iron stairways, of not more than forty-five degrees slant, with steps not less than six inches in width, and twenty-four inches in length."

The Bureau of Fire Escapes of Philadelphia, which consists of the Building Inspectors, Chief Engineer of the Fire Department, and the Fire Marshal, have long felt that the iron ladders running down from the sides or ends of buildings of giddy heights were of but little use, except for the firemen; that employees, particularly females, would take the risk of escape down a burning stairway, or a leap from upper windows, rather than hazard their lives upon these outside iron ladders.

It was mainly through the instrumentality of the Building Inspectors of Philadelphia that section 27 of the amended building laws for cities of the first class in Pennsylvania was enacted by the State Legislature.

Section 27, requiring TOWER FIRE ESCAPES, cites as follows: —

"All buildings to be hereafter erected, or altered to be used as a schoolhouse, church, public building, hall, place of assembly, or resort tenement house, hotel, lodging-house, factory, or workshop, more than two stories in height, shall have at least one stairway accessible from each apartment, which shall be enclosed with brick walls, or partitions, made of incombustible materials, and shall have no interior openings other than the doors of the apartments from which it is an exit. All stores to be hereafter erected or altered, to the extent of twenty-five per centum of the assessed valuation, when more than three stories in height, and in which any one of the stories above the second shall have a clear floor space of not less than four thousand square feet, shall be provided with a TOWER FIRE ESCAPE, enclosed in incombustible material adjoining one of its fronts, and such fire escape, from the first to the second story, may be a spiral staircase.

"Such fire escape shall be held, and taken as a fire escape, under the terms of the act approved June eleventh, one thousand eight hundred and seventy-nine, entitled: 'An act to provide for the better security of life and limb, in cases of fire in hotels and other buildings'; and the several supplements and amendments thereto.

"And, in the case of such stores, in which the clear floor space of any story above the second shall be over ten thousand square feet, the Board of Fire Escapes may require *one or more additional* TOWER FIRE ESCAPES, as above described.

"And all mills more than two stories high, of the floor area, per story, of three thousand square feet or more, shall have such brick-enclosed fire escape, or escapes, as shall be approved by the Board of Fire Escapes. No obstruction shall be placed upon any way of egress from any building. No explosives or inflammable compound, or combustible material, shall be stored or placed under any stairway of any building, or be used in any such place or manner as to obstruct or render egress hazardous in case of fire."

The Tower Fire Escape is a brick or fireproof chamber enclosing a stairway; said chamber may be within or alongside the building, *with no openings into it from the main building.* It is reached from off iron balconies or platforms running along the side or ends of the building, thereby entering the Tower Fire Escape *from the open air.*

The outlets to the balconies should always be on a level with the floors of the main structure.

This kind of an escape cannot be cut off by flames from a lower story, as can the outside iron ladders, but is a safe refuge from the top of the building to the exit into the street below.

It can be made of various sizes, according to the height of the stories of the buildings and the number of persons to use it.

Where there are but few to use it, a smaller tower will answer; but where a large number are to be accommodated, the chamber should be of sufficient size to allow broad, easy stairs and square landings; the steps should have rises of not more than eight inches and tread of not less than ten inches.

Winders should be avoided wherever possible. It is not necessary that the stairs should be of iron, as the chamber is fireproof; wooden steps are much to be preferred.

In hotels where corridors run the whole length of the building, with a main stairway near the centre, a Tower Fire Escape at each end of the hallways makes an exit from the building practically safe.

In hospitals, or other buildings where invalids, aged persons, or children are domiciled, this kind of an escape is invaluable, because the inmates can be carred out in perfect safety.

Where large buildings for manufacturing or other purposes are erected, with Tower stairways at opposite ends of the buildings, and used for ingress and egress daily, there is not the necessity for so many inside stairways.

In all possible cases these Tower escapes should be in daily use for entrance and exit, in order that the user may become familiar with its protection, and thereby realize the fact that when once he enters the chamber his life is practically safe.

The Girls' Normal School of Philadelphia, a model building, located at the northwest corner of Spring Garden and Thirteenth Streets, has *three* Tower Fire Escapes; two of these are used daily by the pupils for exit.

During the last six months there have been erected in Philadelphia *nineteen* Tower Fire Escapes, and in every instance these are giving entire satisfaction.

We are happy to state that the simplicity of construction, and absolute safety of these fire escapes, make them daily grow in popularity, favor, and demand.

The great advantage of these Tower Fire Escapes over any other now in use is that the moment persons in any building on fire reach the inside of the tower they are practically safe; confidence is restored and panics are avoided.

Particular care should be exercised, in the construction of the chamber, to make it *absolutely smoke-proof.*

The false economy of cheap construction of fire escapes for helpless women and children, the aged and enfeebled, the sick, the insane, the prisoner, etc., cannot too loudly be condemned.

In view of the frequent conflagrations and holocausts in large cities, the first duty of those in authority is to provide a practical fireproof provision like the Tower Fire Escape for all the aforementioned subjects.

WM. J. GILLINGHAM.

Philadelphia.

THE C. Pardee works of Perth Amboy, N. J., for some years identified with the manufacture of clay products, has taken up the manufacturing of terra-cotta fireproofing, both hard and porous, and are now in the market with a full line of shapes. They are represented in New England by Mr. W. H. Gates.

IN our November issue we gave notice that Mr. J. L. Worthy would at once rebuild his hotel at Springfield, Mass., which had just been destroyed by the big fire, and suggested that he would probably be open to arguments for fireproofing. We now learn that the plans for a fireproof building have been prepared by Gardner, Pyne & Gardner and that estimates are now being made. The new hotel should receive the patronage of all our readers, as it is best to take no chances when safe accommodations are to be had.

THE site of the old Traveller Building on State Street, Boston, is to be occupied by a towering fireproof structure, which will be much the same problem as the Carter Building, which is just being finished. The site is surrounded by streets, and is of small area, being slightly wider, but only about half as long as the Carter Building. This, so far as we can learn, will be the second use in Boston of the "Chicago" method of building.

WE especially call the attention of readers interested in this department to our leading article, and invite open letters from all who may have something of interest to say apropos of the subject treated there.

THE daily press devotes columns to methods of extinguishing fires, to the blackguarding of each other by fire marshals and chiefs, and similar stuff. Would it not be a good idea to devote some space to the more important question of building to prevent the spread of fire? That is the foundation, and if well attended to it will only be a question of time when the extinguishing of fires will be a small matter

THE BRICKBUILDER

Vol. III. BOSTON, FEBRUARY, 1894. No. 2.

AMERICAN ENAMELLED BRICK.

A paper read at the Annual Convention of the National Brick Manufacturers' Association.

Gentlemen of the National Brick Manufacturers' Association:

I HAVE been assigned the subject of "American Enamelled Brick," and I will endeavor to handle it from a practical standpoint, to the best of my ability, and in as short a manner as possible.

I will not attempt to deal with the history of the enamelled brick industry, except so far as is necessary to make my article clear and intelligible. Until within very recent years the usual method of enamelling brick in this country has been to cover the face of the brick with an opaque enamel, commonly called a "true enamel."

Within the last six or eight years the English, or slip-and-glaze, method has been adopted by a few manufacturers.

I will endeavor to contrast the products of the two processes, and then give you my views concerning the method followed by my own firm, and trust that I will be able to make my meaning clear, so that those who intend to engage in this industry may be able to use my advice intelligently, whether it meets their own particular views or not.

I will first take up the subject of enamelled brick, and will briefly set forth the facts which led us to adopt the other method. I will state frankly that I do not claim to be an expert in the true enamel line, and will not attempt to go into a discussion of the methods employed for fear of giving you false information, or misleading ideas.

Before we engaged in this business we, of course, examined all the available enamelled brick jobs in our immediate vicinity. We found the majority of them laid up in brick of domestic manufacture. In most cases they were red brick, enamelled. The contrast between the domestic brick and the imported article was marked, and, while both had their defects, the imported brick were far superior to those of home manufacture.

We found the English, or glazed, brick more uniform in color, and also that they withstood the hardships to wish they were exposed much better than the enamelled brick. I have seen some very handsome samples of enamelled brick, and must confess that the manufacturer of enamelled brick can turn out some samples that in many respects are much more handsome in the hand than those of his glazed brick competitor; but when it comes to a laid-up wall I have failed to find a single instance in which the general appearance of the wall was not in favor of the glazed brick. Both classes of brick craze to a certain extent, both will peel, and both will vary in color.

In the glazed brick we found these defects less frequent than in the enamelled brick. The enamelled brick presents the more glossy surface, but the glazed brick gives the more level face. In the enamelled brick you must necessarily have a more or less rounded corner on the enamel. The reasons for this are its extreme fusibility and the thickness of the coating required to hide the face of the brick.

The cause of the rounded edge on the enamel is found in the fact that any molten material cannot be caused to flow out squarely to a square edge, any more than could so much water, or other liquid.

In the glazed brick this defect, while it exists to a slight degree, is not noticeable unless attention is called directly to it.

The slip with which the face of the brick is covered, being infusible at the heat required, will stand up square and true along the edge. The glaze, being thin, cannot present this defect in any marked degree, though it can be detected by close examination.

The making of returns or corner brick also presents some difficulties that are patent to all who see fit to examine brick of this class.

In all enamel brick that have come under my notice I have seen very few in which the edge and end were of exactly the same color. These facts led us to adopt the slip-and-glaze process, and so far we have had no cause to regret our choice.

From information I have received I have been led to believe that the manufacture of enamelled brick is attended with more difficulties than that of glazed brick, and what experience I have had in the business seems to verify it. I will now drop the subject of enamelled brick and leave all discussions as to their merits and demerits to those who are more competent of discussing them; but the facts which I have stated can, I presume, be verified in almost any one of our large cities by any one interested. He will have enamelled brick and enamelled brick, and glazed brick and glazed brick, some better and some worse; and from the appearance and apparent durability of the material he can draw his own conclusions. Poor glazed brick are very poor; poor enamelled brick are in the same boat, and he will find many of each class upon which to pass judgment.

In the manufacture of glazed brick the most essential point to decide is that of a suitable clay. To produce a good article it is necessary that the clay should stand a fairly high degree of heat without warping or twisting, and as the heat required is very near, if not quite, the melting point of cast iron, it is obvious that iron in those forms in which it would be likely to cause spots on the face of the brick is very injurious, and, unless it can be easily gotten rid of, will ruin any clay for enamelling purposes. An excess of lime will also give trouble. I presume you are all acquainted with the effect of pebbles containing lime, and further comment is unnecessary. When iron or lime is combined with, or evenly diffused through, the clay, they are not nearly so objectionable, though not desirable. They are both fluxes at the heat mentioned, and if lime is counteracted by an excess of finely divided or combined silica, we can stand more of it than we can in highly aluminous clays. If the clay contains too much alumina, it is apt to cause "crazing," and also to cause glaze to "curdle" or draw up.

Too much combined or very finely divided silica will cause what is known as "shivering."

In the case of "crazing," the body of the brick is too strong; and, in the case of "shivering," it is too weak.

When the silica contained in the clay is partly combined in the shape of comparatively coarse particles or stones, it will do no harm unless greatly in excess, provided it is finely ground before use.

The shrinkage of the clay is also an item to be considered. This can be regulated by the addition of finely ground burned clay, known as crush, grit, or grog. Never use sand to lessen shrinkage. Its use is very dangerous, and is liable to cause peeling, while crush will be found to be very reliable. All crush should be finely ground. Coarse crush, while it will answer the purpose better probably than fine, will give a wavy appearance to the face of the brick, owing to the fact that the clay will shrink in burning, while the crush will not; and those particles near the face of the brick will hold it up at that particular point and cause a slight elevation there, which will render the effect of reflected light anything but pleasant.

In my own experience I have never seen any single clay that I could unhesitatingly recommend for the manufacture of glazed brick without the addition of a clay of a different nature, or some material to give it either the proper chemical or physical characteristics. It must possess certain physical characteristics in order to admit of the manipulations necessary to product the article economically. So far I have never succeeded in successfully treating a dry or semi-dry brick by this process. I must admit, however, that when one does happen to turn out a good sample of semi-dry glazed brick it is very handsome. But we found the percentage of good brick very low, and consequently have abandoned it.

Hand-made, soft, or stiff mud brick are best adapted to this process, and the clay must, of course, be adapted to one or another of these methods of manufacture. This will, of course, determine the physical characteristics of the clay so far as the making of the brick is concerned.

I take it for granted that all of you can determine the physical qualities necessary for these processes, as well as for the following process of pressing.

When this is satisfactorily disposed of, the question of contraction in drying of slip, glaze, and brick must be considered. If both the slip and the glaze are applied to the brick when dry, this question needs no consideration here, but must be considered when slip and glaze are prepared, and they, not the body of the brick, must be made to suit this particular case.

When slip is applied to the green brick immediately after pressing, it is necessary to use a slip containing a considerable amount of tough clay, in order to secure the proper working qualities, and here the question of contraction in both slip and brick must be considered. The brick in drying must contract enough to admit of the use of such a slip in order to give you a smooth face, clear of "pinholes" and other defects caused by the shortness of the slip.

So also must the contraction in burning be practically the same as the contraction of the slip. This difficulty can be conquered by alteration of either body or slip, or both, as may seem advisable.

It is in the kiln that the chemical defects nearly always show themselves, and the proportions of silica, alumina, and other elements which usually enter into the composition of the clay must be properly adjusted in order to insure success.

As before stated, an excess of alumina is not desirable. It causes warping of the brick, both in drying and in burning, and makes the body of the brick too dense for the proper application of a glaze.

The density and consequent strength of the body are the great sources of crazing, and, when this effect cannot be overcome by carefully burning, it will in all probability be due to an excess of alumina, or lime, or other fluxes in the clay. Alumina also gives a dull appearance to the glaze in many cases.

Silica causes shivering and peeling. Shivering and peeling are to a great extent the same defect, though they are produced by different causes.

Shivering is caused by an excess of silica alone, while peeling is produced by the same defect in the clay, but is, I think, developed in the worst form by an excess of silica together with an excess of fluxing elements, which attack and combine with a large percentage of the silica at a certain heat in the kiln, thereby causing a sudden shrinkage. This will cause a rupture between brick and slip, and develops peeling in its most aggravated form.

It is evident, therefore, that the most important matter connected with this method of producing glazed (commonly called enamelled) brick is a proper clay or mixture of clays; and, owing to the well-known fact that nearly all clays vary materially in different parts of the same bed, I would always advise, when possible to do so, the use of a mixture of two or more clays, as less liable to affect the body of the brick by simultaneous variation in their component parts.

To emphasize this, I will give the following facts: Analysis of a sample of one of the clays used by us showed, total silica, 79.15%; alumina and iron, 15.32%. Two months later the analysis of clay from the same bed showed, total silica, 69.26%; alumina and iron, 20.41%. Had we been depending on this clay alone, we would undoubtedly have gotten into serious trouble; but as we were using a mixture of clays it did not affect us so much. But at the same time its effects were very apparent in our brick, and, owing to this excessive variation in this particular clay, we were obliged to abandon it, though it had been giving us satisfactory results for more than a year. This variation was in both the combined and uncombined silica, and it happened to occur in just such a form that it was not noticeable in the working of the clay, and was not discovered until we found that our product was not up to its ordinary standard, and by that time we had several thousand brick in the kilns and in course of manufacture. While the loss in this case was serious, it was not a circumstance to what it would have been had we been using a single clay, and it had happened to vary so much in its chemical constituents. I give this experience in order to show the importance of having a constant body to work on.

Silica tends to brighten most enamels and glazes, while alumina is very apt to have an opposite effect. Variation in these two elements in the body of the brick will, therefore, destroy that uniformity of surface which is desirable in this class of brick, and no matter what process is used it will be found that the body will to a certain extent exert its influence for good or evil, on the face of the brick, be it glazed or enamelled.

In view of these facts I would strongly advise the intending enamelled brick manufacturer to use a mixture of at least two clays in such proportions as will give the desired result, and regulate the shrinkage by the addition of more or less fine-ground burned clay, which should be fine enough to pass through a sieve with a mesh not over one sixteenth of an inch square.

The amount of this material will depend upon its fineness, upon the toughness of the clay, and upon the result desired. The tougher the clay, the more crush it will carry, and the fineness of the crush used must be determined by the working of the clay. Make it as fine as you can to work properly both in drying and in burning.

It may seem superfluous to give so much space and take up so much time with what seems to be the only part of the business that would be understood by all of you, but it is the rock upon which more hopes have been wrecked than any other one thing connected with the glazed brick business. This is what usually floors our English cousin when he comes over here and attempts to work American clays.

This is what drives our American manufacturers into the devious ways of true enamels, double burnings, and other attendant evils. I do not mean to say that all ways leading to the use of true enamels are devious, but in my opinion the glazed brick will, when its necessary evils have been overcome, be found far more profitable to manufacture, when viewed from an economic standpoint, because it is usually more reliable, requires but one burning, and last, but not least, it sells itself.

Having given so much time to the body of the brick, we must necessarily cut the balance and least important part of our paper short.

A glazed brick is one whose face is covered by a colored slip. A slip is a mixture of the proper materials that is infusible at the heat employed in the glazing operation. The slip is covered by a substance somewhat of the nature of a glass that is more or less thoroughly fused. When this mixture becomes transparent or semi-transparent at the heat employed, it is called a glaze. When it remains opaque, it is called an enamel.

To be called either a glaze or an enamel, it must present that smooth, glossy surface which characterizes these substances, otherwise to all intents and purposes it remains a slip at that particular heat.

I make this statement to show the relation between these technical names, that we may not be confused by subsequent discussion which may arise. Therefore, it will be understood by all that when the word "slip" is used it means a mixture that is infusible at the heat used by the person who gives it that name.

An enamel is a substance that is more or less thoroughly fused but remains opaque at the heat employed by the person who gives it that name. A glaze, on the contrary, is a mixture that becomes transparent or semi-transparent (whether colored or not) at the heat employed by the person who gives it that name.

Having now attempted to give a clear idea of what I mean by slips, enamels, and glazes, and prepared a foundation upon which, I think, we may all stand during any discussion which may follow, I will proceed with my subject.

Slips are prepared by mixing clay, flint, feldspar, and other substances in such proportions that they will adhere to the face of the brick both in drying and burning, and the proportions of the different ingredients must be suited to the work in hand. They must be infusible at the heat employed, yet must contain enough fusible material to enable them to adhere to the face of the brick. These proportions vary materially, and no recipe can be given that will meet all cases owing to the different conditions governing them.

At the heat at which I am accustomed to working clay, flint and feldspar are the only materials to be considered with the coloring matter. Others may find it necessary to use other ingredients, but if such is the case I would advise more heat and less soft materials. They are likely to give trouble in burning. Slips should be thoroughly mixed with water to the proper consistency and sifted through a sieve not coarser than No. 100 brass, and finer if possible. The slip is applied to the face of the brick by dipping, and should be as thick as is possible to use it and give a smooth face. Don't be afraid of its pulling. If it does, either body or slip is wrong. I have seen bricks with a quarter of an inch of fine clay on the face, though it was not put on in the form of a slip, and it was impossible to cause a rupture between brick and clay without breaking one or the other. This clay was stuck on to the brick by a coating of slip that was made of exactly the same ingredients as the clay. In fact, in every instance the clay was simply the slip dried until it could be handled, and stuck on the face of the brick with a coating of slip between the two. I do not recommend this at all as a profitable method to follow, but mention it to show what can be done if brick and slip are properly adapted one to the other.

When a slip is to be applied to a dry brick, it must be necessarily thinner than for green brick, and this method is not to be highly recommended owing to the difficulty of handling the brick during the succeeding operations of glazing, cleaning, and setting. A slip to suit a dry brick must be very short, and has as a consequence very little strength when dry, and is liable to be clipped in handling.

Glazes and enamels are composed largely of the same ingredients as slips, with the addition of suitable fluxing materials. At the heat mentioned it will be unnecessary to use soluble fluxes, and lead will be volatilized and dissipated, thus rendering its use unprofitable and inadvisable.

At lower heats lead can be used to advantage, but soluble fluxes are always dangerous in raw glazes or enamels, and, if used to any appreciable extent, frequently act on the slip, and in the case of the enamels on the face of the brick. Being soluble, they are carried by the water into the brick and are sometimes a prolific source of cracks. If soluble fluxes are necessary, they should be calcined or "fritted" with a portion of the other ingredients before they are used. This destroys their solubility and prevents danger from the source mentioned.

At the proper heat frit glazes will be found unnecessary, but there can be no question as to the advisability of using them should occasion demand it.

All glazes and enamels should be thoroughly ground and passed through a sieve at least as fine as No. 100 brass, and finer if possible. Glazes should be as thin as it is possible to use them and produce the desired result.

The same rule applies to enamels, but enamels must be thicker than glazes owing to the necessity of hiding the face of the brick with the one coat. In some cases it is necessary to use colored glazes or enamels in the slip-and-glaze method, but the coating of the slip should in no case be omitted, nor is it necessary to burn the brick twice in order to accomplish your object. It can be applied, when necessary, while the brick is green, and with just as good if not better results, as at any other time.

After the brick is glazed and dry it is necessary to take off the spare slip, glaze, or enamel along the sides and on the heads. This can be done with any suitable tool. The next and a very important operation is burning. The heat at which I am accustomed to work is about the melting point of cast iron in the cooler parts of the kiln.

It is necessary to use a crowned kiln to reach this heat successfully and economically.

The method of setting varies, some setting the bricks open, in which case down-draft kilns are a necessity. Others use saggers, when up-draft kilns can be used, but the down-draft kiln properly constructed will be found most economical. In my own experience I have found saggers, all things considered, most economical, but have always understood that English manufacturers burned their brick open. The operation of burning does not differ very materially, except in some minor details, from that employed in burning other clay wares.

The brick must be dried out gradually until the kiln is red hot, or nearly so, from top to bottom, when a quick finish produces the most brilliant glaze.

The cooling operation should receive close attention, as quick cooling and light firing, either separately or together, are prolific sources of crazing. The bricks, if properly annealed, will not craze if body, slip, and glaze, or enamel, are properly suited to each other.

I have taken up a great deal of time, yet I have only skimmed over my subject. There is so much to say and so little space to say it in that I feel many of you will feel disappointed, but not more so than I am myself at the meagreness of the information given as compared with the time occupied.

Phœnixville, Pa. JOSIAH MILLER.

GLAZED BRICK: THEIR ORIGIN, VALUE, AND USES.*

A PAPER READ BEFORE THE NATIONAL BRICKMAKERS' ASSOCIATION AT ITS EIGHTH ANNUAL CONVENTION, CONVENED AT CHICAGO, JAN. 2, 1894.

ABOUT 300 years ago a man who might well be canonized as the patron saint of workers in clay wrote, "The number of my years hath given me courage to tell you that, a short time since, I was considering the color of my beard, which caused me to reflect on the few days still remaining before my race should end; and this made me admire the lilies and corn in the fields, and several sorts of plants, which change their green color to white when they are about to bear fruit. Thus, also, certain trees burst into flower when they feel that their natural vegetative vigor is like to cease. . . . Wherefore, it is a just and reasonable thing that each should endeavor to multiply the talent which he hath received from God. . . . Therefore have I endeavored to bring to light those things which it hath pleased God to make me understand, to the profit of posterity."

In these terms does a poor potter, nearly ninety years of age, express himself in the preface to his writings and conversations with himself, in which he treats of his trials, his afflictions, and his life, for his own amusement and for the encouragement of others. The passage might be taken for an extract from the confessions of St. Augustine, or of Jean Jacques Rousseau, or of a writer and philosopher, great both in ideas and in style. This writer, this philosopher, is but a workman who has grown old between the trowel and the furnace, with his hands still soiled by the clay that he moulded all his days. We never felt more strongly than in studying the life of this man, that greatness does not depend upon position, but is a gift of nature.

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* In presenting what we have gathered for your consideration at this time, we desire to say that we are largely indebted to Alphonso De Lamartine, also to the principal manufacturers of glazed brick in England and the United States, and especially to Mr. Henry R. Griffen, late Superintendent of Griffen Enamelled Brick Company of Oaks, Pa., and Mr. E. Matheson, Managing Director of Farnley Company, Leeds, England, for the technical information offered.

The potter was Bernard de Palissy (A. D. 1510–1589). While young he kneaded marl and burnt bricks at his father's kiln, in the village of Chapelle-Biron, in Perigord. But the youth was moved by that desire of doing well whatever we do, which leads the reflecting man to surpass what he sees done by others, and which, at length, gives him the key to all the discoveries in intellectual or manual labor. While moulding his coarse clay, and gazing on the brick that had become hard and red in the fire of the furnace, he was thinking of the forms, the reliefs, the handles, the ornaments, and the figures of the vases, which already presented themselves to his imagination, and of the glazes and enamels with which he was one day to cover his masterpieces of earthenware.

Pottery — that is to say, the business of tempering, moulding, and baking earth, either in the sun or in the fire — is one of the earliest of human occupations. The mud which retains the footmark offers itself naturally as an element ready either for the sport or utility of the first inhabitants of the earth. Vases and cups, to hold the liquids necessary to quench thirst, were used by man as a substitute for the hollow of the hand, as soon as he had left off drinking at the pool like the beasts of the field. An improved kind of earthenware, fit for cooking food, must have closely followed the invention of fire. From the first clay jar or earthen cup to the colored glaze of the Etruscan vases, the enamelled porcelain of China or Japan, or the indelible pictures fixed by fire on the surface of the fire ware of Sevres, we may trace each step of the immense scale which separates the rude handicraft from the exquisite art.

On the fall of the Roman Empire the art of tempering, moulding, ornamenting. sculpturing, varnishing, and painting earthenware disappeared with the other arts. Christianity at its commencement opposed all these as being too intimately allied with idolatry. Temples, statues, tombs, urns, vases, and pagan vessels,— it proscribed all, that it might model the world anew. The Greeks of Byzantium alone preserved some of the traditional processes of this art of their fathers, and exercised them at Damascus, the greatest manufacturing city of the Levant, and from which the glazed and painted vases were spread over all the world as articles of regal luxury. These wares were, however, clumsy and tasteless; they evinced the decay of an art that was lost. But while the West was successively creating, losing, and endeavoring to recover the art of pottery, the ancient nations of the extreme East had been, unknown to us, for thousands of years making that painted, glazed, and semi-transparent porcelain which has been for ages the delight of the Chinese and Japanese. They have reached such a perfection of material, form, and color that even to this day our imitations can hardly compete with them; and if artistic civilization were to be measured by superiority in the manufacturing of earthernware, the West must bow before the East. Even the most ancient annals of China mention as unknown the date of the invention of porcelain.

But these wonders of the extreme East were still unknown in the West in the fourteenth century. Glazed earthenware appears for the first time in the pavement of the Alhambra of Granada, and in the mosques of the Moors of Spain. The art was introduced into Europe through Arabia. It was not until a century later that the famous Luca della Robbia, the Palissy of Tuscany, became celebrated for enamelled earthenware in Italy. A moulder of clay, he succeeded, after persevering labor, in covering and varnishing his works with a white glaze unaffected by what destroys the surface of unglazed earthenware. The manufacturing cities of Florence and Faenza, from which last is derived the French word *faience*, owed to him their trade and their celebrity. Painting soon took possession of his enamel as of an imperishable canvas, and the pictures of the great masters were copied, fired, and made everlasting on these disks of porcelain. Sculpture endeavored to rival its sister art, and grouped its statuettes and bas-reliefs round the vases, cups, ewers, and plates of baked earthenware.

Such was the condition of the earthenware manufacture when Bernard de Palissy was making tiles, bricks, and earthenware bottles to hold water, wine, and oil.

Bernard de Palissy is the most perfect model of the workman. It is by his example, rather than by his works, that he has exercised an influence on civilization, and that he has deserved a place to himself amongst the men who have ennobled humanity.

He is the patriarch of the workshop; the poet of manual labor in modern days; he is the potter of the Odyssey, the Bible, and the gospel, the type incarnate to exalt and ennoble every business, however trivial, so that it has labor for its means, progress and duty for its motive, and the glory of God for its aim.

He has thus won a legitimate place among the great men who have risen from obscurity.

Some will say, "But he has only moulded clay." What can it signify? Greatness does not depend upon the occupation, but upon the mind. If such a man be little, who, then, is great?

Some thirty years ago the Farnley Iron Company, and one of its neighbors in business at or near Leeds, England, finding that the fire clay found in connection with the coal seams in that district was particularly suitable for allowing an enamelled surface, began the manufacture of glazed brick.

For some years after the trade was started the bricks made were very inferior compared with those of the present day; the best bricks of that day not being at all equal to what are sold as second quality now. Notwithstanding this, the bricks found immediate sale with architects, especially in London, where they were used, partly for sanitary reasons (the glazed surface being washable and non-absorbent) and partly for light afforded in narrow alleys and courts. As the quality of the bricks improved with the experience of the makers, the demand still further increased, and they are now used in large quantities in all English cities.

It is estimated approximately the total output capacity of the Leeds district is about four to five millions per week. Of these numbers, not more than sixty per cent can be reckoned on as first quality, and thirty per cent second quality; the remainder, as thirds, are available only as building brick. These thirds are valuable where strength is required; the superior clay and hard burning make them of high value, because of their resistance to crushing loads.

It is worthy of note here that, in placing enamelled brick where they are to be subjected to heavy loads, care must be used in setting, that the superincumbent force does not press on the outer edge of the brick, as the enamel will give way if more than its share of the load is imposed upon it.

Probably about one sixth of the product of the Leeds factories is shipped and used in America, where they may be said to be the *standard* for good, serviceable enamelled brick, and the excellent quality to which they have attained must be equalled by our American manufacturers before they can justly claim to have first quality glazed brick.

It is a pleasure to be able to state that at this time there are at least two American manufacturers who have nearly attained to the excellence of the best English makers; in fact, they do equal them in the durability of this product, their success in getting clays and glazes to fuse being fully up to the English; and the only difference in the American and English brick is that our manufacturers have thus far failed in finding a clay with all the necessary qualities that will, after burning, have a surface as smooth as is the product of our English friends.

The only American manufacturers who have thus far succeeded in making a thoroughly good and merchantable glazed brick from the standpoint of the English standard are the Griffen Enamelled Brick Company of Oaks, Pa., and Sayer and Fisher Company of New York.

The experience of our American as well as the English manufacturers in getting the manufacture of glazed bricks started on a successful basis has been fraught with many sad experiences; and with them, as with the makers of other kinds of brick, the workings of clays and enamels have been "eye-openers," and in all cases success has only been attained at a great cost in money, and vexation of spirit.

There are various methods of glazing bricks: —

First, slipping and glazing while green, and then firing.

Second, enamelling green and firing.

Third, slipping green, firing, and then glazing and re-firing.

Fourth, burning, then enamelling, then firing again.

Fifth, burning, then clipping and glazing, then firing again.

The fourth and fifth methods avoid many difficulties of the first and second; the third method avoids about half of these difficulties.

The fourth method is both the best and poorest, except the fifth method; that is, the best brick can be made by that method, and the poorest are made, except those made by the fifth method.

A good fire-clay brick first burned, then enamelled with a good, high heat enamel, and reburned at a high heat, will make a brick that is absolutely indestructible, but the expense of the fire clay, added to the double burning, is too much.

The fifth method is very bad, because it is as expensive as the fourth, and not so reliable.

The third method is as good as the first, but as expensive as the fourth and fifth.

The second method is still more difficult than the first and just as expensive. It presents all the difficulties of the first with the added difficulty of iron spots developing in burning, due to enamel being directly in contact with the impure fire-clay face of brick.

The first method is, all things considered, the most practicable; still the difficulties to be overcome are enormous. First you have three different materials, a brick, a slip, and a glaze, which must all stand the same heat, and must all shrink alike during the whole operation; then you must have a mixture for your brick that will not shrink too much, or the brick will warp; it must not develop iron specks; must not blister in enamelling; must not pinhole; slip must stick to it well; must not shiver; must not craze; must not crack in pressing; must be strong; must cut decently; must not discolor the enamel or glaze: many clays are barred due to the last condition. Many clays that are good in other respects will crack in pressing; many will craze; many will shiver; many will warp; many will give iron specks, and very many will not properly hold the slip. Some will blister, and some pinhole.

The latter, blistering and pinholing, are largely a matter of manipulation, and some clays simply show a tendency which proper handling will overcome.

One successful manufacturer says, "'I have handled in my experience over two hundred different clays, and I do not believe that there are more than five or six of them that are good for enamelled brick, though many of them might be used after much experimenting. There are very few clays which I would pronounce impossible to enamel."

The same manufacturer says, "Our process is to make the brick, press them, dip them in slip, then in glaze, and burn."

The English makers generally, Sayer and Fisher Company, and the Griffen Company, use process No. 1. We do not know of any one using process No. 2. Somerset uses process No. 3. Zanesville makers, Excelsior Stone and Brick Company of Philadelphia, and Matawan Company use process 4. Phillipsburg uses process No. 5. The principal difficulties with process No. 1 are cracking, crazing, shivering, and warping.

The principal difficulties of process No. 2, if used, would be the same with addition of uneven color, due to brick body showing through enamel, more on some bricks than others.

Process No. 3, the same as No. 1, except warping; warped brick can be rejected between burnings, but expense is added.

Process No. 4, crazing, shivering, cracking, and color of body showing.

Process No. 5. The tendency to pin in this process is so great that it condemns it without going into other difficulties.

An enamel is a translucent glaze, and never reached absolute opacity; consequently if over a colored body its color is dependent on thickness of enamel, degree of fusion, etc.

A slip is absolutely opaque, and hides body of brick entirely.

Glazed brick become a necessity in our cities, for area and alley walls, where light is desired; but their use in baths, cafés, smoking-rooms, fish and butcher markets, railroad stations, grocery and butter stores, stable walls, cold storage and brewery vaults, etc., etc., where cleanliness is requisite and the daily use of water a necessity, should speedily follow the experience in their favor in the older cities of the world. By their use sanitary satisfaction can be secured, and at the same time beautiful architectural effects accomplished.

One modern use in Europe, worthy of imitation in American cities, is the construction of underground urinals which, while avoiding any obstruction above the street lines, afford a clean, well-lighted convenience. American visitors to London will no doubt have noticed these places, all of which are lined with glazed bricks.

The size of English brick (3 ins. by 9 ins. by 4½ ins.) seems likely to become the standard size in this country for glazed brick, as they can be made English size at not over fifteen per cent above cost of American size. The English size brick gain about 33⅓ per cent over the American size in laying, besides being about $8 per 1,000 less expensive in labor and materials in laying. The English size brick at, say, $115 per 1,000 are cheaper for the contractor than American size at $68 per 1,000; also you will find that the larger surface of the English size gives a better effect and appearance to the wall when laid; and there are fewer joints to aid in gathering dust and soot.

Those who have to do with the building trades in our Eastern as well as in our Western cities, to any extent, seem to be satisfied with inferior grades of manufacture. This, we believe, to be a mistake, and especially so as regards all kinds of brick, including enamelled.

If the story of Palissy's trials (to be found complete in Lamartine's "Lives of Celebrated People") trying to bring to perfection the art of enamelling could do away with the spurious and inferior work, even in the enamelling of brick, his story has not been told in vain. We are building for time, not for to-day alone. America in her buildings should learn a lesson from the Old World on what we can do for posterity. It is not for the dollar that we may save in buying or selling a poor stone or poor brick. In every walk of life, in art, in science, and in trade, we hope that the bells that rung out the year 1893, and rung in the new year 1894, yet in its infancy, "rung out the false and rung in the true."

George B. Engle, Jr.

Chicago.

HOW CAN WE BEST SECURE TRAINED HELP?

A PAPER READ AT THE EIGHTH ANNUAL CONVENTION OF THE NATIONAL BRICK MANUFACTURERS' ASSOCIATION.

I HAVE noticed in the columns of the *Clay-worker* during the past year, articles from several of the members of this association, in all of which the value of scientific training and special education for clay-workers has formed the theme. The point of view from which these writers look at the subject (R. Brick–D. Crossley) is naturally different somewhat in each case. Some recommend the use of the present educational apparatus of the country, and others think that better results would be had by establishing practical schools on the manual training system. But in all cases a substantial unanimity of opinion prevails on one thing, and that is the ability of science, and especially chemical science, to help the clay-worker in his daily work.

During the summer of 1883, and again in 1892, it was my fortune to be employed by the State Geological Survey of Ohio in investigating and preparing a report on the condition of the clay-working industries of that State. In the course of this investigation, I was, of course, thrown into intimate relations with the workers of all branches of the ceramic art, and thus had usually favorable opportunities to find out what the status of the clay-workers was in regard to the scientific aspect of their business.

It was a surprise to me in my first trip to find the use of chemical or other scientific information so small, but after nine years had passed, and I again made the rounds and observed the wonderful expansion and increase in prosperity, and the distinct but less visible improvement in the quality of the wares manufactured, I was, indeed, amazed to find that very little, if any, change had taken place in regard to the use of chemistry or other technical knowledge.

There are, perhaps, several principal reasons for this fact: first, I think, is the misapprehension which I find exists very generally among the clay-workers as to the way that chemistry or science can be employed in their business. Most of them think that what is recommended to them means that they shall employ a chemist in their factory to analyze their clays and test their product. In some branches of clay-working this indeed is a perfectly feasible and rational suggestion. But the number of such cases is very small. What most factories need is not a chemist to work every day in his laboratory, but a manager or superintendent who has had the benefit of a chemical course, and who understands the subject whether he has the practical skill to make analyses or not. Many men who are by nature kindly disposed towards the use of improved means in their business have considered this subject, and after looking the matter through they could see no gain in proportion to the monthly salary of even a young chemist. No wonder they thought that way. In most brick works and sewer-pipe factories a chemist, to do nothing else but make analyses, is no more required than a skilled electrician would be to take care of a dozen or so of electric lights. In other words, it is not a multiplicity of analyses that is wanted: it is management by a man who knows what analysis means and how to use it.

And this ought not to be at all out of the reach of even small clay works, for if brickmakers show a desire to put men of this class forward into their positions of trust, like burners, foremen, and superintendents, there is no doubt that there will be plenty of bright young fellows glad to qualify themselves for this work.

A second reason is found in the fact that so far no American college has yet offered a course in ceramics or has even announced that they are prepared to give special instructions in that branch of chemistry which deals with the problems of clay-working.

Now, chemistry is a very broad science: it is much too large a field for any one man to cover, even if he devotes his life to the study. But the general laws of chemistry, and the framework or skeleton in which all the vast array of detail hangs, are by no means so complicated but that any good mind can master and use them. The application of these laws and principles to any one kind of technological business is in itself a full field of study for any man to undertake. A chemist cannot master the technical chemistry of iron-making without much time and patient labor. Paper-making, glass-making, clay-working, fertilizer manufacture, cement-making, and in fact dozens of special branches, each require the use of a different set of facts, though all hang directly to the great and important framework before described.

Now, the technical chemistry of clays is not especially difficult or complex, unless it be made to include composition and use of glazes, enamels, and other compounds where the variety of chemical elements used to produce the different colors is very large. But while in general the chemistry of ceramics is not exceptionally difficult, nevertheless it is quite distinct and separate from any other kind of chemical work, and thus it happens that no college course supplies just exactly what a skilled clay-worker ought to know.

The degree of Engineer of Mines as taught in most of the standard schools of the country is much more nearly in line with the requirements of clay-working than any other course. But it fits a man equally well for the position of blast-furnace superintendent or gold miner; so it is easily seen that, though a graduate in this course knows the principles on which clay-working rests, still he has to learn all the details which make his knowledge useful and practical after he leaves school.

Also, to take the course of Engineer of Mines requires that the student shall be fairly well advanced before beginning it, and that he shall spend four years in taking his degree.

This in itself is necessary, because to fit a man to even enter so wide a range of professions as belongs to this course requires the pursuit of many studies and the use of much time. But to master the scientific work especially needed in ceramics alone need not be so long a matter.

The studies which are especially useful in this course are geology, mineralogy, chemistry, metallurgy, civil engineering, mechanics, and perhaps electricity.

Geology, especially in its economic aspect, is useful in defining the origin of clays, both as to the mineral itself and as to its location. We learn what the influences were which brought the clays into the deposits where we find them, and how to look for clays, how to trace and identify them.

Mineralogy instructs us on the composition of clay as a mineral. It shows us that pure clay is a very rare mineral, and that what we call clay is a mixture of a number of minerals.

It explains how the proportions of these minerals vary in different clays, and how some of them are called impurities on account of their effect on the nature of the clay.

Chemistry has already been described as the mainspring of all our knowledge regarding ceramics. Metallurgy is the application of chemistry to the problems of extracting the metals from their ores, but it incidentally brings in much that is of prime importance in ceramics.

The formation of silicates by heat, their fusion and thermal properties, the nature of fluxes and refractories, the nature and combustion of fuel, the construction of furnaces, kilns, and apparatus for generating heat, and many other subjects, are considered, which any one can see are directly useful to the work of clay-burning.

The engineering sciences, civil and mechanical, both contribute much that is useful to the clay-workers, but is knowledge which is connected with the construction of factories and the manufacturing operations, and the use of the materials made, rather than in considering the nature of the material itself. Civil engineering is the great art of construction, in supplying the demands of which most of our factories find their work. Naturally, knowledge of this study must be useful not only in the factory, but in keeping the products constantly abreast of modern improvements and the increasing demands of engineers and architects.

And certainly no practical clay-worker would consider an education complete without some instruction on the topic of mechanics, — the use of steam, the generation of power, how to convey and apply it.

Also the design, construction, and repair of machinery is a subject which he will learn by bitter experience in the shop, if he does not at school; for what clay-worker is there who has not put in many a night and Sunday in patching up his machinery for another trial?

Electricity has so far been of very limited use to the clay-worker. As a means of generating power, its development is proceeding so rapidly that none of us can tell to what extent it may be used in our time in our factories, and for this reason its principles ought to receive some notice in a technical course.

The use of manual training as an adjunct to technical education has been lately introduced in some schools. No one can dispute its value, especially to a student who has never had any experience in the practical part of the study he is pursuing. It enables a man to judge of the work, both in quantity and quality, which others are doing for him, and makes him quick to detect laziness and negligence in his employees simply by the light of personal experience. This is unquestionably valuable, and wellnigh indispensable to any man who has to handle the labor of others.

In a full ceramic course extending over a period of four years, manual training should be incorporated.

Some of the previous writers on this topic have contended that a clay-workers' school should be largely practical, and that it should contain machinery of all common types, — dryers and kilns, and everything that clay-workers use, — so that the scholar learn by experience the practical knowledge of the shop. In my judgment this plan is neither wise nor feasible. Men go to school to learn principles, not to learn the minute details of their life-work. No school of any kind pretends to turn out men competent to step at once to the front rank of practical technical work.

The idea and principle of education is to train the intellect so as to enable it to judge in later life of the correctness or fallacy of whatever comes before it. The best plan to learn practical clay-working is right in the brickyard or pottery.

So much as to the studies of a ceramic course.

As I have said before, no American college gives anything in this line.

While distributing some of the literature of the Ohio Geological Survey recently, I received a request for a volume for the professor of ceramics in the Imperial University of Japan, who is now in Berlin on leave of absence, perfecting himself in all that modern German chemistry and technology can add to his already rich store of information. It seemed to me a great reproach to this country that little Japan should teach branches of science which Americans have to go to Europe to study.

There are two things needed in connection with this subject. One is a formal ceramic course attached to some university able financially and scientifically to make it equal to that of any foreign school. This is no light matter; it cannot be done in a day, nor can it assume its place at the head of the American clay-working fraternity except by a process of growth.

The second thing needed is one which is easier to get, and more directly and plainly valuable to the practical clay-workers of the country. This is a short ceramic course, designed to take as pupils the able and clear-minded young fellows whom we have employed in our factories as burners, firemen, and high-grade workers, and give them in a two years' course all that can be condensed into that period of the sciences which I have before mentioned. These young men, the pick and flower of the clay-workers, would come to college full of the practical knowledge of the brickyard and pottery. They would have a good many erroneous ideas to knock out, and a good many prejudices to overcome, but, in two years' time devoted closely to the study of what they need most to know, they would go back to their work with new and enlarged ideas of its dignity and possibilities.

Surely there is nothing impracticable or visionary about such a scheme.

In Ohio we have a short mining course, devoted to the education of practical miners, who come to the school at the age of thirty or thirty-five years frequently, and who have been prevented from rising in their work simply from lack of the very technical education they are thus enabled to get; also, we have a short agricultural course, in which the young farmers can get in two years the heart and core of what the full and formal degree would give them.

There has never been a more beneficent application of the educational machinery of the State than in these short technical courses. It is the simplest and most successful way to raise the standard of technical industry, and if the plan has been tried successfully on miners and farmers, why should it not succeed on clay-workers? The importance of the industry certainly demands it, and the utter lack of such training in any regular course makes it still more urgent that a short practical course should be prepared. What can the N. B. M. A. do toward furthering this cause?

It is not for me, a new member, who is attending his first convention, and who is not yet familiar with the objects and aims and possibilities of this Association, to suggest any radical steps, even on a line so directly important for the good of the industry as this kind of education undoubtedly is. But there are others here who will be able to formulate some steps to put us on record as conscious of our need, and our willingness to assist the cause forward.

Edward Orton, Jr.

Columbus, O.

BRICK AND MARBLE IN THE MIDDLE AGES.

(Continued.)

CHAPTER II.

"For pallid Autumn once again
Hath swell'd each torrent of the hill;
Her clouds collect, her shadows sail,
And watery winds that sweep the vale
Grow loud and louder still."
— *Campbell.*

AT Basel we engaged a *voiturier* to take us to Baden, whence the old Swiss railway was to have the privilege of conveying us to Zurich. Our scheme for reaching Italy was to pass by the lakes of Zurich and Wallenstadt, and then, following the valley of the Rhine, to cross over the pass of the Splügen to Chiavenna, and so to reach Lake Como.

We left Basel at two o'clock in the afternoon, hoping to reach Baden by about nine; the weather looked threatening, but we took a cheerful view of this, as of everything else, as all good travellers should, and comforted ourselves with the thought that at any rate we could better afford to have a wet day between Basel and Baden than between Zurich and the Splügen.

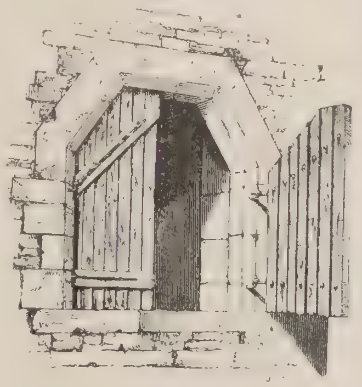
The view of the city as you leave it is certainly very striking; the cathedral spires are picturesque in their outline, and the number of churches with turrets and steep roofs combine with them to produce a most ecclesiastical-looking town. Nor need any one interested in architecture despair of finding much pleasure in a more careful inspection of its buildings. They are full of interest, though generally passed too rapidly by people in a hurry to get on to enjoy the pleasures which await them beyond.

The roofing of the cathedral is worthy of notice as being composed of variously colored tiles, arranged in diamond patterns over the surface of the roof, and giving a degree of richness to the coloring of this generally heavy part of the building which is very admirable.

In another fine church of the early part of the fourteenth century here, I remember being amused to see how quietly the storks possess themselves of all kinds of places for their nests, and think even the ridge of the steep roof of a church a proper place for their abode. The good people at Basel build their chimneys with flat tops for the express benefit of their long-legged friends, who, from their elevated and well-warmed abodes, look down sedately, and with a well-satisfied air upon their unfledged brethren below.

Why the people here love storks, the people of Venice pigeons, and the people of Berne bears, I leave to more industrious inquirers to decide, satisfied only to notice the fact that it is so, as each of these fancies adds one to the list of local peculiarities so valuable in the recollections of a journey.

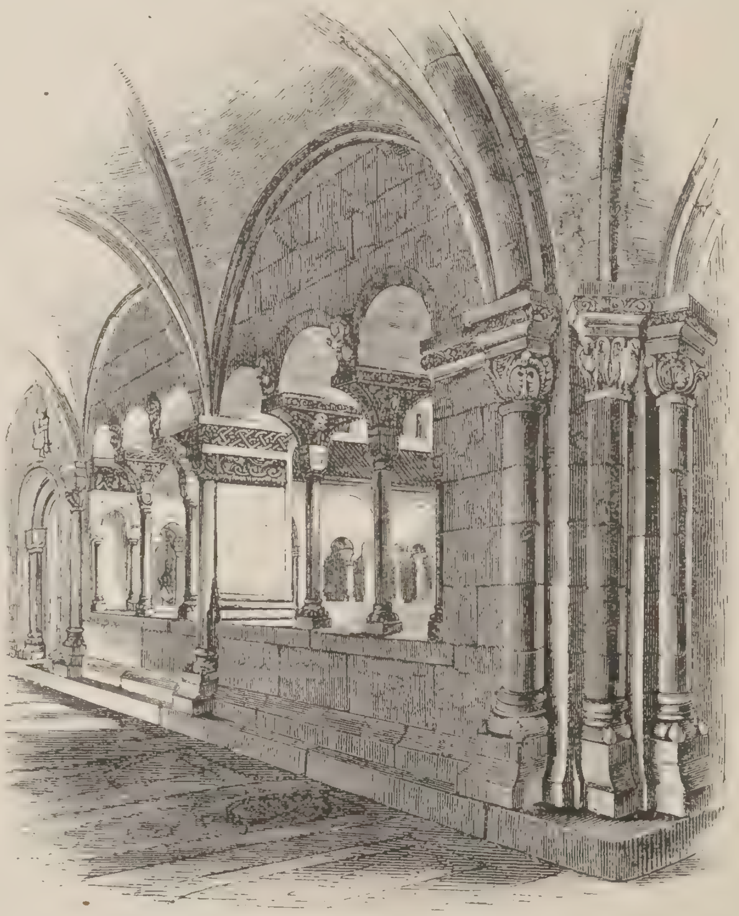
The road from Basel to Baden is for the first half of the way very pretty; we came in, unfortunately, for rather drenching rain, and so lost all beyond the suggestion of some striking views. The towns through which we passed were not of much interest, though there were many picturesque and pleasant-looking subjects for the pencil. The most striking place on the road was Rheinfelden, a largish village (or perhaps I ought to say small town, as it rejoices in a Rath-haus of some pretension), surrounded by very high walls, and entered by tall stone gate-towers, pierced with pointed arches, and surmounted by upper stages of timber, with tiled roofs of quaint and effective character; and here and at Stein and Baden I noticed that almost all the houses were old and very little altered. I observed particularly the old shop windows of very simple design, closed with folding shutters, and taking one back to old times most decidedly in their design.



SHOP WINDOW, RHEINFELDEN.

Beyond Rheinfelden the road, which so far has skirted the Rhine rather closely, leaves it again for a few miles until it touches it for the last time at the small town of Stein.

From Stein we saw an imposing-looking church on the other side of the river at Sekingen. It has a great western front with two bulbous-topped steeples, and is of very considerable length. The division between choir and nave is marked by a delicate turret, and the whole church, as far as one can judge by a distant view, looks as though it would well repay a visit. There are six bays in the nave, five and an apse in the choir. The former has very simple windows, whilst in the latter they are rather elaborate. There is no aisle to the choir and no transept.


CLOISTER, ZURICH CATHEDRAL.

The rain continued incessantly until we reached the long, straggling village of Frick, a quaint and antique-looking place, where our *voiturier* stopped for an hour to bait his horses, who, however, at Rheinfelden had enjoyed a treat in the shape of a loaf of very brown bread, a kind of food second only, in the estimation of foreign steeds, to the precious *morceaux* of lump sugar with which Swiss *voituriers* are so fond of encouraging and petting them.

We were nothing loth to stretch our legs: and, finding that the church was worthless, — one of those unhappy, bulbous-roofed erections so common in some parts of the Continent, and the roof of even the eastern apse of which was twisted into a most ingenious and ugly compound curve. — we took up our quarters in the respectable hostelry and "Bierbrauerei" of the Angel, and devoted ourselves to the consumption of coffee and beer of no bad quality. Our host wished sadly to see us located under his roof for the night, but we were resolute in our determination to reach Baden that night, and so persisted in going, though to our subsequent regret.

It was soon dark, and the new moon, which shone cheerfully upon us, gave us just a glimpse occasionally of the scenery, which about Brugg, where we crossed the Aar, and again at Königsfelden, seemed to be remarkably good.

At last, at about half past ten o'clock, we reached what we fondly hoped was to be our resting-place. But Baden chose not to take us in, and to our horror, as we drove up to the chief and only available inn, we were met with the dismal announcement from the mouth of the civil landlord, that all the rooms were full.

However, we dismounted, and found that there was no other inn in Baden proper, but that at the Baths there were several: at them our landlord assured us that he knew we should find no room, and so we thought it useless to return and try. Our only course seemed to be to feed our horses again and then go on to Zurich; and as Swiss drivers and Swiss horses never seem to tire of trotting on slowly and drowsily along the road, there was no difficulty in at once coming to an arrangement with our coachman.

Accordingly, at midnight we started again, hoping at some early hour in the morning to reach Zurich. It was sufficiently provoking to be toiling on slowly and sleepily for nearly four hours almost alongside of a railroad which would have taken us early the next morning in three quarters of an hour; but there was no help for it, and so we did the best we could, by sleeping whenever we were able, to pass the weary hours away.

At last, just as the day began to dawn, we came in sight of Zurich and its lake, and last, not least, we reached the great hotel. Here we pulled up, knocked desperately, awoke the slumbering porter — but, alas! only to hear again the unwelcome sounds which had greeted our ears at Baden! He suggested, however, that at the Hôtel Belle Vue we should probably find beds, and so on we drove, rather in despair at our prospects, though, happily, unnecessarily so, for the Belle Vue gladly opened its arms for our reception, and ere long we were, oblivious of all our toil, comfortably ensconced in bed. From our windows we had a pleasant view of our quarters; it was broad daylight, and the prospect was — as from such a position, looking up a lake, it always is — very fair and charming.

We were up again soon after eight, and were glad to find the morning fine, though the clouds were low, and we saw, consequently, nothing of the distant view of mountains which lends its greatest charms to Zurich. The town is, however, pretty and striking. The picturesque houses, with wooded hills on all sides beyond them, and very charming views of the lake, if they do not make its attractions first-rate, at any rate make them very considerable.

The main feature of interest for me was the cathedral, a fine Romanesque church, very fairly perfect, but mutilated in its interior arrangements by the Calvinists, in whose hands it now is. In plan, it has a nave with aisles of six bays, a short choir, and east of this a square-ended sanctuary, the aisles having apses, roofed with semi-domes. In the nave two of the aisle-arches make one groining bay. The transverse groining-ribs are of a simple square section, the diagonal ribs having in addition a large round member. The triforium is very large and fine, and is made use of for congregational purposes, being fitted up with seats, which, curiously enough, are all made to turn up as misereres. There are no transepts. The sanctuary arch is loftier than the choir arch, and seems to have been intended to be very distinctly marked. In the clerestory there are two simple round-headed lights in each bay; the choir is arcaded all round internally, and for frigidity of effect cannot be surpassed; the internal fittings comprise an immense pulpit, but, so far as I could see, not even an apology for an altar.

The exterior has two western steeples, and a north doorway, each jamb of which has three detached shafts, standing considerably in advance of the wall, which is entirely covered with diapers. The arch itself is semicircular, and very simple in its moulding; but this simplicity rather adds to than detracts from its general grandeur of effect. The whole is inserted in an additional thickness of wall, set on, as it were, against the original wall; and the extreme width of the doorway itself is no less than eighteen feet nine inches. The cloisters were remarkable, and very good of their kind; the arches rested on detached shafts, the capitals of which were elaborately carved in a very peculiar manner, but very effectively. The whole design was unlike any Northern Romanesque, and bore much more similarity to the best Lombard work. Unfortunately, the whole of this cloister was rebuilt in 1851, the carving having been re-worked or renewed throughout in imitation of the original. It will be seen, however, that, in spite of alterations, this is a very fine church, of a very early type, and peculiarly valuable in a country which, like Switzerland, has comparatively little left that is really good in the way of architectural examples.

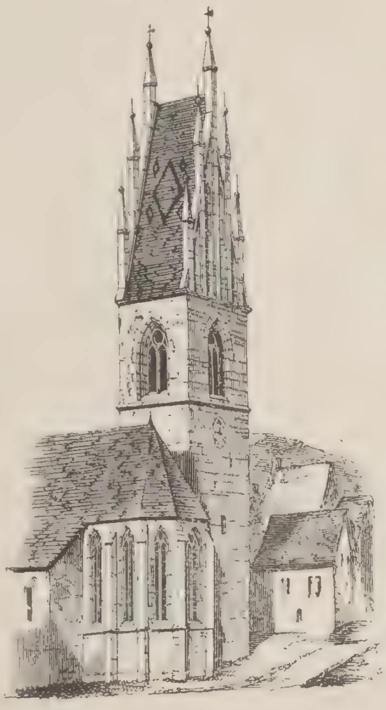
There are other churches in Zurich, but I believe not old, and at any rate I had no time to examine them. One of them is appropriated to the use of the Roman Catholics; and there is one desecrated, rising from the edge of the lake, aud forming a prominent object in the general view of the town as you leave by the steamer; this is of good outline, but has no details remaining of any value. The point chiefly to be noticed in the churches of Zurich appears to be the way in which their spires are all painted red, looking in the full sunshine very bright and picturesque.

The Swiss have a great feeling for bright color, and on our way from Basel to Baden we noticed one of the many instances of this in several turrets covered with brightly colored glazed tiles. A light green seems to be the favorite color, and is commonly used without mixture with any other. They look best with their lower side rounded, and when of small size; and are constantly used in turrets rising out of roofs which are entirely covered with plain tiles. I remember, two years before, noticing with extreme pleasure the beauty of some dark-green tiles used at Schaffhausen; and I have already had occasion to mention those on the cathedral at Basel with equal commendation. Unhappily, we have to lament that English people, in their insane hatred of bright colors, if they saw such tiles used in England, would be horrified at such a violation of the correct simplicity and uniformity of color to which the cheapness of slate has made them accustomed. Some modern attempts, however, at introducing colored tiles have not been so successful as could be wished; and of all, perhaps the least so is the roof of the new Maria Hilf Church at Munich, on which tiles of light-blue color are used in such large masses that at first sight it seems that half the roof is stripped, and that the pale-blue sky is seen instead of roof.

At ten o'clock we left our hotel by the steamer for Schmerikon at the head of the lake of Zurich. The weather still looked doubtful, though much better than on the previous day, and our host of the Belle Vue, taking a good view of this, as is a landlord's duty, conducted us to the boat with smiling anticipations of fine days to come.

The shores of the lake are, for the greater part of its length, literally fringed with houses all painted white, and contrasting violently with the trees, vineyards, and green hills by which they are backed. On the north, the shore is low and gradually shelving down to the water; on the south it is rather more precipitous, but after all not very striking. At the head of the lake heavy, dark, round clouds hung upon the hills, and left us in pleasant doubt as to whether or no we had fine mountains to discover when they cleared away; a doubt, as it happened, not settled as far as we were concerned, save by certain lively and not too trustworthy representations which we afterwards met with, in the shape of advertisements of the Zurich hotels, and which showed a line of snow mountains as the ordinary horizon of their visitors.

The churches on the lake are very numerous and very similar. The steeples are almost always gabled, and from these gables rise spires painted red, and very thin and taper in their form. The gabled sides of the towers are generally made useful rather than ornamental by the introduction of enormous clock dials. The only decidedly mediæval church which I saw between Zurich and Rapperswyl was at one of the villages on the north shore of the lake, I think at Meilen, but I am rather uncertain as to the name. Its design is both novel and very good; the pinnacles on the gable being unusual in saddle-backed steeples, and giving considerable picturesqueness of outline. The accompanying woodcut will show the general character of the design, and it will be seen that the tower is on the north side of the choir. The steeple roof is covered with grayish-red tiles, with a pattern marked on them with yellow tiles.


CHURCH ON THE LAKE OF ZURICH.

The steamers on this, as on most Swiss lakes, are somewhat tedious in their journeys, as they take a most zig-zag course, first calling on one side of the lake and then on the other, until one doubts whether one will ever reach the journey's end. At Horgen, of course, we discharged a large proportion of our English passengers, who were all bound for the Rigi, but their places were soon occupied by the umbrella-loving natives, who flocked in and out of the boat in great numbers at every station, and by the time we reach Rapperswyl we had no more fellow-countrymen in the boat, and, perhaps, like many Englishmen, to say the truth, we then first thoroughly realized that we were abroad. Much as one loves one's country, certainly one source of pleasure when abroad is the not hearing too much English spoken, or seeing too many English faces.

At Rapperswyl, famous for having the longest bridge in the world, there is a most conspicuous group of buildings on rising ground above the lake, very picturesquely thrown together; it consists of a church and a castle; the latter has several towers capped with pyramidal and saddle-backed roofs, and the former has two towers in the position of transepts, with saddle-back roofs gabled north and south, the southern tower being considerably the larger of the two. Altogether, the group is one of uncommon variety and picturesqueness of outline. Below, in the town, is a small church, with a most happily conceived, though very simple bell-turret rising out of the roof, square in its plan, but capped with an octagonal spirelet. This is a not uncommon plan in this part of Switzerland, and is always most agreeable in its effect. The views from the terrace by the side of this castle are of singular beauty. It is high enough above the lake to command a good view of its whole expanse, and to secure a not too distant view of some of the mountain peaks of Glarus. Rapperswyl is a good point to stop at, for the sake of a visit to the famous pilgrimage church at Einsiedeln, certainly one of the spots in Switzerland most curious and interesting, though its building have no claims to our regard on the score of architectural beauty.

Passing under, or, rather, through the bridge, we found that it was very narrow and had no side railing of any kind, so that it appears to be far from a pleasant contrivance for crossing the mile or two of shallow water which here scarce serves to keep up the appearance even of a lake: and perhaps it is upon the score of the absence of real dangers of drowning if one fell over that they dispense with any protection. At Schmerikon, which we reached in four hours from Zurich, we left our steamer, and immediately embarked on a barge, in order to go by the Linth canal to Wesen; but we found that, however expeditious this might be in descending, it was a kind of conveyance not to be recommended highly to any one wishing to ascend the canal, inasmuch as — unlike ordinary canals — this is neither more nor less than the glacier torrent of the Linth, bringing down the melting snow from the Glärnitsch and Todi glaciers, and rushing along at a really tremendous pace. To those, however, who have time, it may be commended as affording magnificent views of the mountains of Glarus, and of those which rise so grandly above the Lake of Wallenstadt.

As we entered the canal from the lake we were amused by the unsuccessful attempts of our crew to secure some wild fowl, two of which they succeeded in shooting, and then, without any kind of regard for the feelings of passengers panting to arrive at Wesen in the promised two hours and a half, they deliberately proceeded — of course in vain — to chase the unhappy birds, which, though wounded, were quite able to dive much deeper than their enemies could reach, and so the only consequence of the chase was a hearty laugh at the expense of the baffled sportsmen, half an hour's delay, and much lost ground to be made up.

The entrance to the canal was very striking; a low hill covered with larch and birch rose from the water's edge, and above this, the mountains, gradually shelving upwards, were terminated in a line of rocky ridges of very grand and rugged character. Whilst we were admiring the view a slight shower passed over us, and the sun, suddenly breaking out, produced one of those lovely effects of color so peculiar to mountain scenery; a rainbow seemed exactly to fill up one of the great basins formed by the undulations of the mountains, and, after bathing a great sweep of mountain side in the richest and most distinctly marked colors, gradually died away.

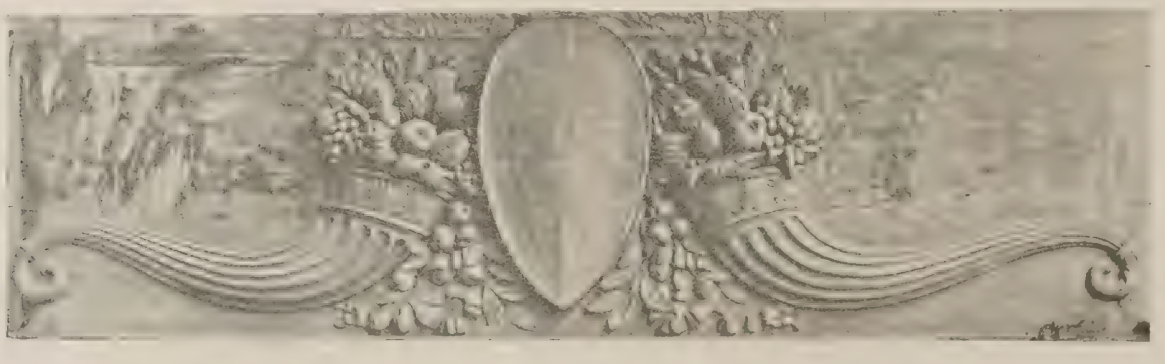
The canal, which at first looks more like a river, soon takes a bend to the southwest, and then, passing under a quaint wooden bridge, over which passes the road to Uznach, we found ourselves in what certainly looked sufficiently canal-like. The stream is so rapid that the walls built up on either side are preserved from being washed away by stone groins running out into the stream and acting as so many breakwaters to keep the water in the centre. Slowly and steadily our horses pulled us up, whilst we, mounted on the top of the cabin, were able to see over the walled sides of the canal and to enjoy the glorious prospect before us.

Before long our captain blandly informed us that he was going to stop for dinner at a wayside house, so we, anxious to make the same good use of our time, attempted to follow his example. Unfortunately the landlord, though very jolly-looking, had a very badly stocked larder, and we had to satisfy ourselves with bread, honey, and wine. It is true, indeed, that our host did produce same cold meat, — portion, as I imagined, of a goat dressed some ten days back, — but this was not eatable, and was valuable only as furnishing an opportunity to him of showing his perfect power of making the best of a bad thing. To season the goat he brought in vinegar and oil, and, putting them upon the table, exclaimed with some *empressement*, "*Voilà, monsieur; mais la vinaigre n'est pas bon!*" just as if this was the strongest recommendation he could give us! We laughed heartily, avoided the vinegar, and parted good friends with our host, thanking him from our hearts for having saved us the painful operation of making the discovery about its quality for ourselves!

Our not very satisfying repast finished, we embarked again upon our barge, and in the occasional intervals, when sudden and heavy storms of rain obliged us to seek shelter in the cabin, we were much amused in watching the proceedings of some men belonging to the boat, who spent the whole of the five hours consumed in the journey in an unceasing game of cards; I must do them the justice to say that they played very good-humoredly, and laughed without ceasing. Under no circumstances could we have seen the scenery more gloriously; occasional bright gleams of sunshine broke in upon and followed clouds of the most inky hue, and then came pelting down heavy showers, accompanied by howling wind, and darkness; and as we reached the opening of the valley, looking up beyond Glarus to the great mountains which close in its upper end, I think the effect was really more grand and terrific than anything I have ever seen. The mountains are of very fine outline, and of great height, as we saw by the more than occasional glimpses which we had of snow about their summits. By the time we reached Wesen the wind was so violent that we found it difficult to keep our places upon the top of the cabin; and we disembarked just before the dark, in time to see the fine mountains on each side of the Lake of Wallenstadt here and there through the storm clouds, and its waters beaten by the wind into not insignificant waves. We had to walk through the entire length of the village — picturesque, quaint little place, sheltered under the almost overhanging rocks at the side of the water — and arrived at last at the capital and thoroughly Swiss inn, the Hôtel de l'Epée, where we were to sleep.

Travellers now speed very differently along this country, and, I fear, see less than they ought of its beauties. Steamboats no longer attempt to pass beyond Rapperswyl, and the railway hurries one along by the beautiful Lake of Wallenstadt to the valley of the Rhine, only earning one's gratitude when one is in violent haste, and because by a branch line it makes a detour to Glarus and Stachelberg much more possible than it was when first I made the journey. On the whole, I fear, where railways pass through beautiful scenery, the tourist loses more than he can possibly gain, not only in the views of the country, but equally in the incidents of travel, which are becoming only too monotonous and similar everywhere.

(*To be continued.*)

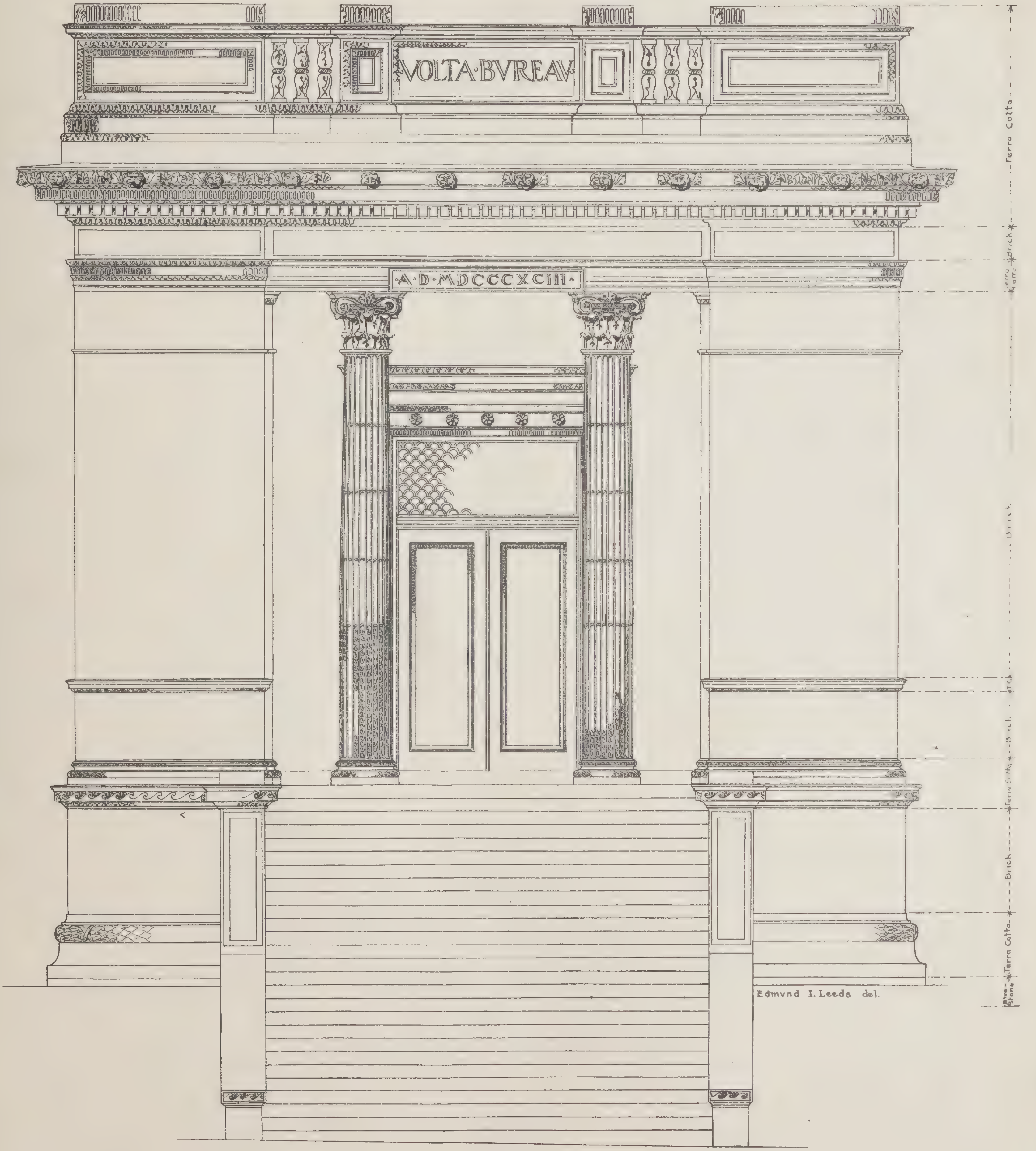


DETAIL OF WINDOW HEADS, VOLTA BUREAU, WASHINGTON, D. C.
PEABODY & STEARNS, ARCHITECTS. PERTH AMBOY TERRA-COTTA CO., MAKERS.

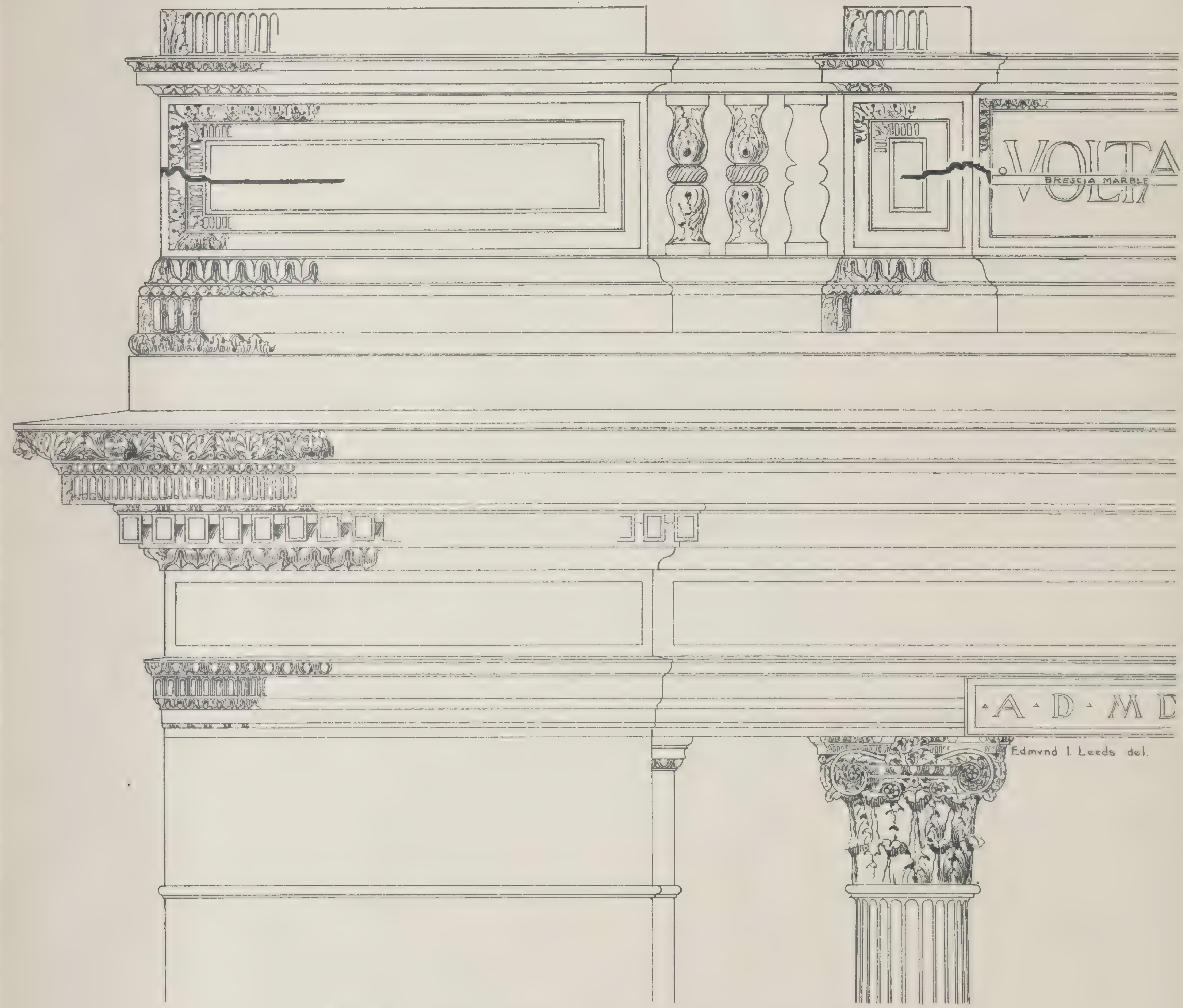
• VOLTA • BVREAV •

WASHINGTON D.C.

PEABODY AND STEARNS ARCHITECTS.



• FRONT • ELEVATION •



DETAIL OF CORNICE AND BALVSTRADE.

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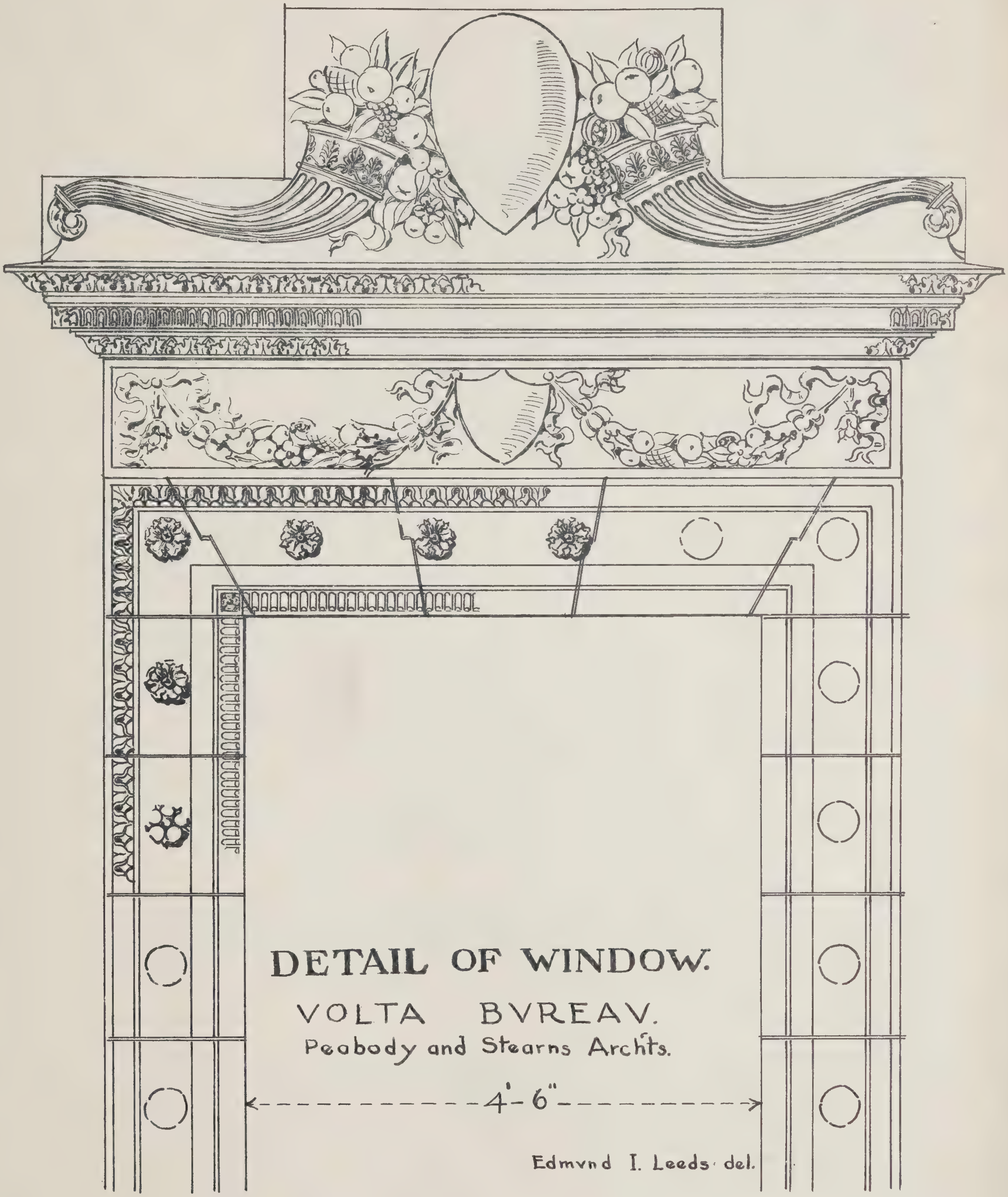
Peabody and Stearns Architects.



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Peabody and Stearns Archts.

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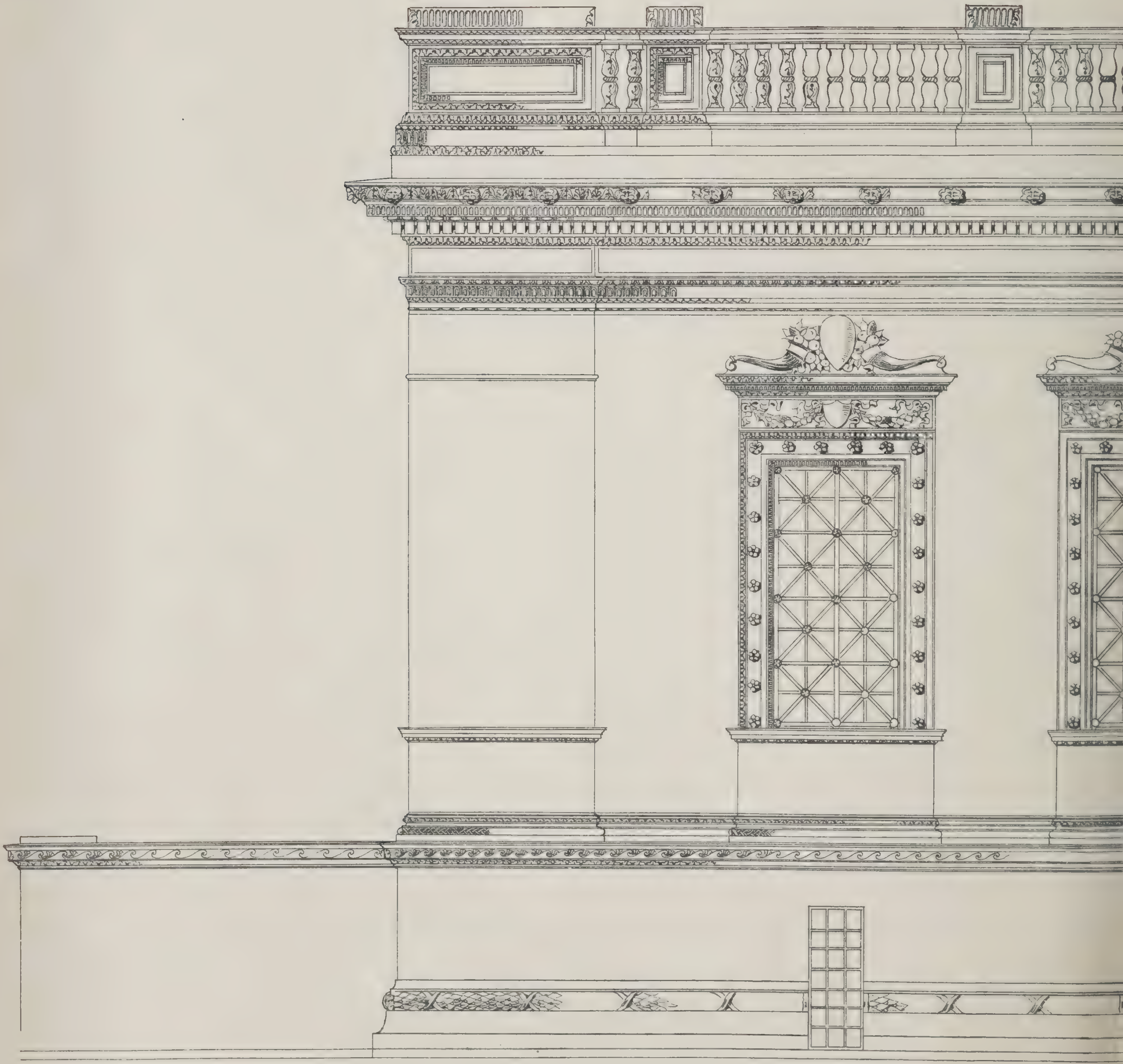

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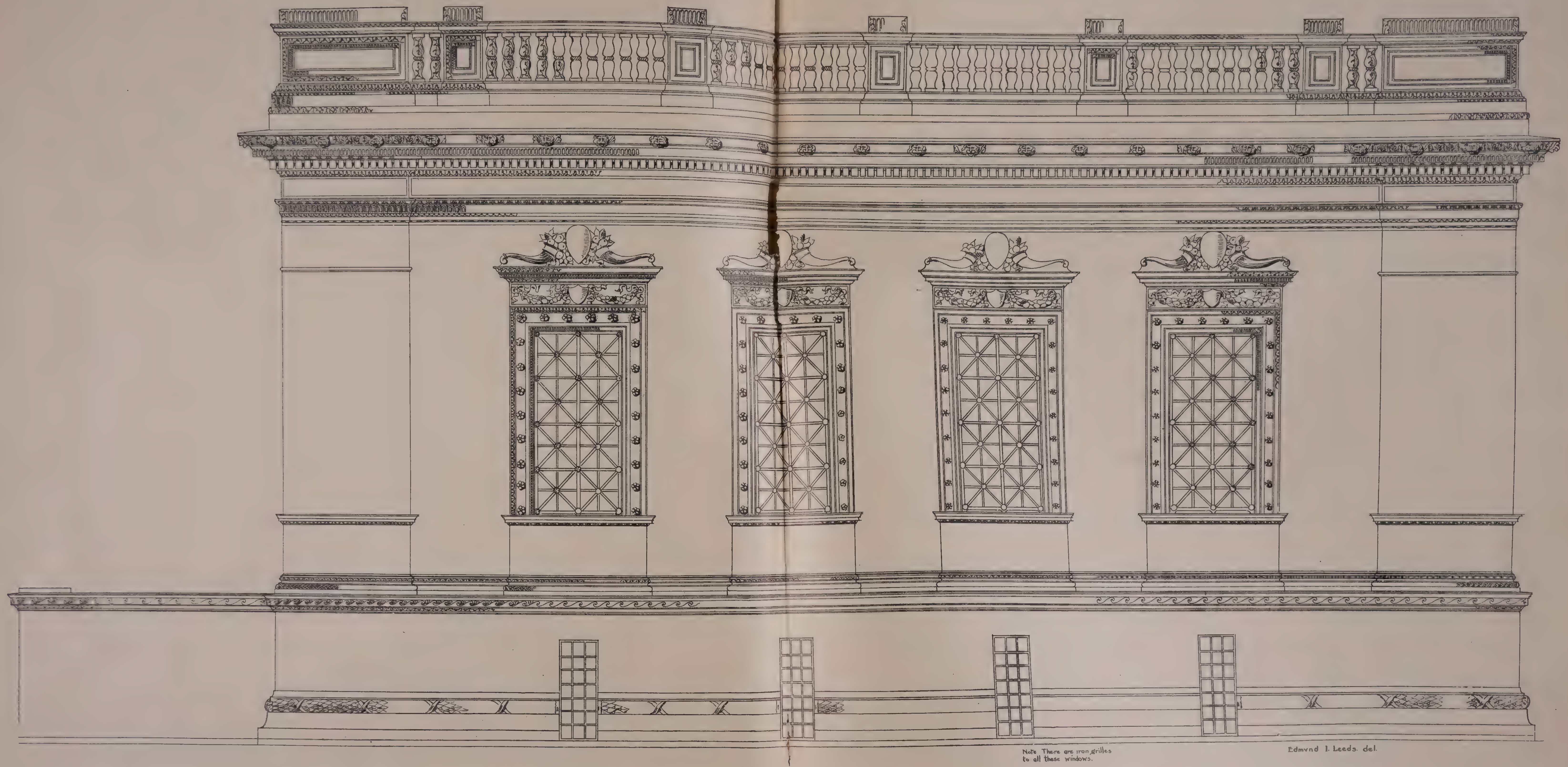
PEABODY AND STEARNS ARCHITECTS



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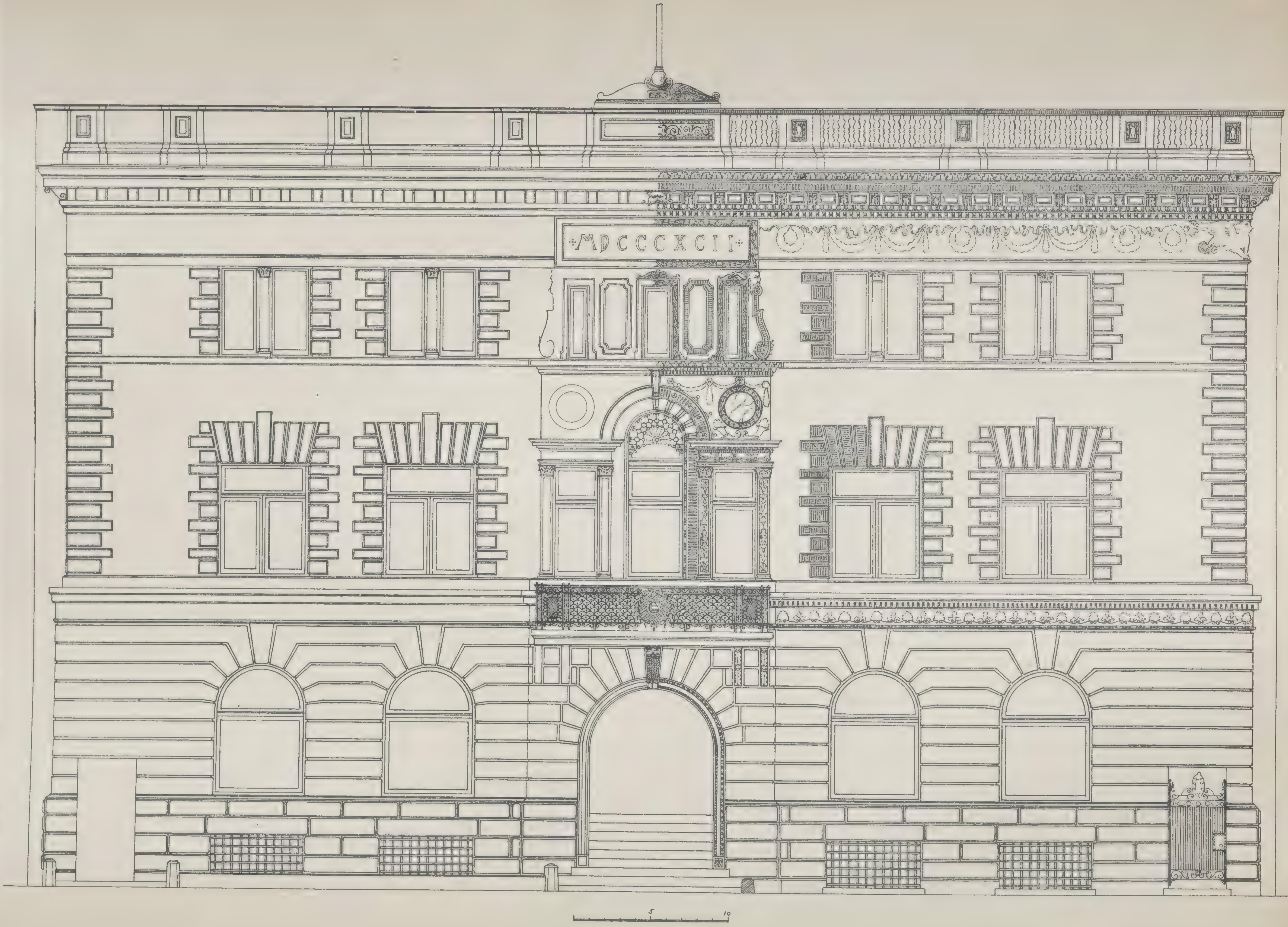
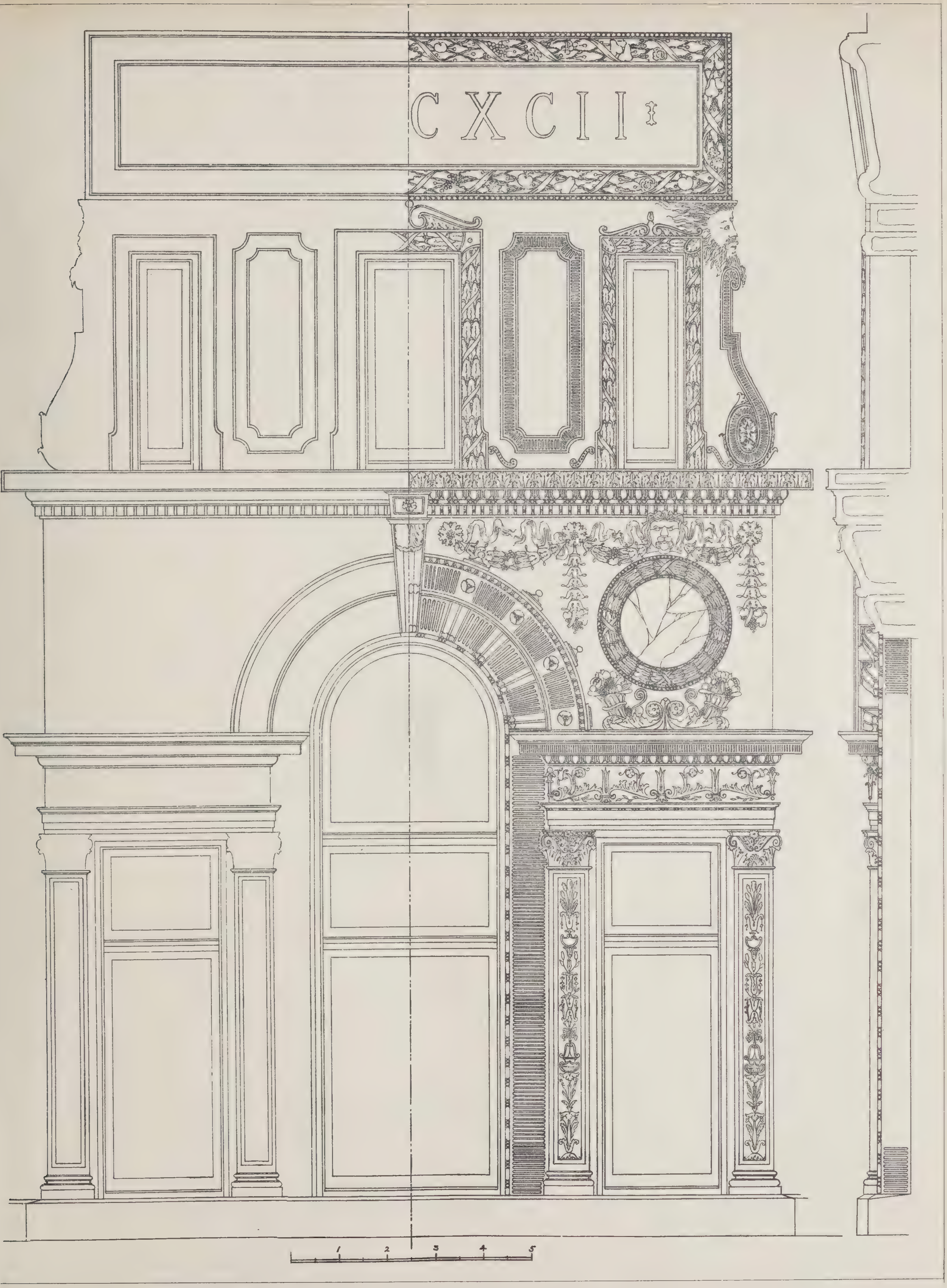


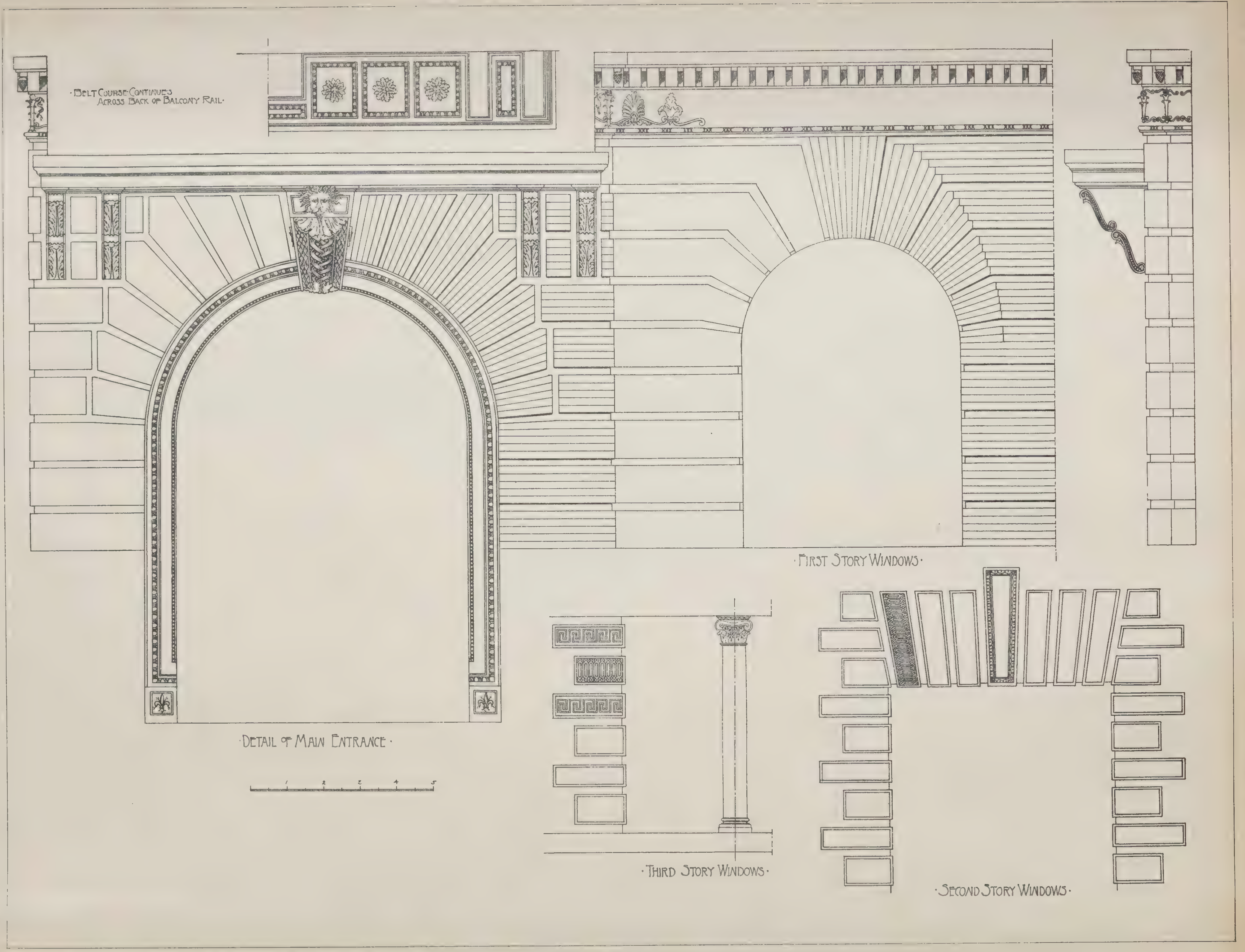
DETAIL OF CENTRE PORTION OF EUREKA CLUB BUILDING, ROCHESTER, N. Y.

NOLAN, NOLAN & STERN, ARCHITECTS, ROCHESTER.



FRONT ELEVATION OF EUREKA CLUB BUILDING, ROCHESTER, N. Y.

NOLAN, NOLAN & STERN, ARCHITECTS, ROCHESTER.


·BELT COURSE CONTINUES ACROSS BACK OF BALCONY RAIL·
·FIRST STORY WINDOWS·
·DETAIL OF MAIN ENTRANCE·
1
2
3
4
5
·THIRD STORY WINDOWS·
·SECOND STORY WINDOWS·

DETAIL OF EUREKA CLUB BUILDING ROCHESTER, N. Y.

ANNUAL CONVENTIONS.

THE NATIONAL BRICKMAKERS' CONVENTION.

THE Eighth Annual Convention of the National Brickmakers' Association of the United States, held in the Auditorium, Chicago, beginning Jan. 23, and continuing through the week, certainly must have been productive of results gratifying to the committee having the affair in charge, and the some three hundred and fifty members of the Association who were present.

Chicago's reputation for hospitality, and doing things generally on a broad and liberal scale, was well taken care of by Messrs. D. V. Purrington, W. H. Alsip, W. D. Gates, and others of the committee, representing the Chicago craft, whose special purpose it was to extend visiting members a royal welcome; while the convenience and general well-being of all were as usual looked after by that prince of good fellows, Theo Randall, secretary of the Association, who, by the way, is the William H. Sayward of the brickmakers' craft.

The banquet was a grand affair, which must have taxed not only the Chicago brethren's purses, but the resources of the Bonifaces who hold forth at the Auditorium.

The postprandial exercises were made particularly brilliant by the speech of R. B. Morrison of Rome, Ga., who, in the absence of George M. Fiske of Boston, responded to the toast, "The Old North and the New South," in a very eloquent manner; while Hon. Anthony Ittner of St. Louis rendered, in masterly style, Knox's poem, "Oh, Why Should the Spirit of Mortal be Proud?"

The toast, "The Ladies," was well taken care of by W. D. Gates of Chicago, whose droll, characteristic style has made him a great favorite as an after-dinner speaker at these annual feasts.

The business meetings held during the week were characterized by harmony and good-feeling throughout, and the close attention given by members to the several very excellent papers read, some of which we reprint in another column.

In fact, the interest manifested by members in the open discussions which followed the reading of these papers; the character of the remarks, in many instances taking the form of experiences which had been productive of good or poor results, intended as they were to be of assistance to fellow-manufacturers; the free exchanging of ideas and suggestions; the complete devotion to their profession; and the manifest desire of all to improve their own methods, and be in every way up to date,— stamped the members of the National Brick Manufacturers' Association as progressive, broad, and liberal, and well worthy to look after the interests of the coming building material.

CONVENTION GOSSIP.

'Rah for Chicago and Chicago hospitality!

Presidents may come, and presidents may go, but Secy. Randall goes on forever. Selah!

Messrs. Chesholm, Boyd & White had the winner of the blue ribbon on exhibition.

No need to send out for a chaplain when Mr. W. A. Endaly of Cincinnati is present.

We print in another column the very able paper by Joshua Miller of Phœnixville, Pa., on enamelled brick as compared with glazed.

We are indebted to Mr. D. V. Purrington, chairman of the Reception Committee, for many courtesies extended.

The century card of the Wallace Manufacturing Company, Frankford, Ind., was quite the taking thing of the convention.

There was no doubt in the minds of many that brick is the coming paving as well as building material.

Pres. W. H. Alsip is a college-bred man, who gave up the practice of law to enter the brick manufacturing business.

The brick paving in some of the larger Western cities has proven to be in every way superior to other paving materials used.

Many ladies, wives, and daughters of the members were present during the convention, and we agree with the gentleman from the South: they should have attended the banquet.

Congratulations to A. S. Blaffer, of New Orleans, the genial third vice-president, upon his escape from serious difficulty into which he was led by his characteristic gallantry.

First Vice-Pres. Edwin McGraw of Pittsburg presided very gracefully in the absence of Pres. Alsip. He is well placed in the line for promotion.

The exhibit of J. W. Penfield & Son of Willoughby, O., must have been made at quite an expense. But we are told that the results were quite satisfactory.

New Haven was well represented by J. Wheaton Stone of the McLargon Brick Machine Company, Capt. S. P. Crafts, and Isaac L. Stiles. Mr. Stiles has the honor of being second vice-president for the ensuing year.

Mr. Frank B. McAvoy, of the firm of T. B. McAvoy & Sons, brick manufacturers of Philadelphia, offered to pledge his concern for one thousand dollars towards the establishment of a course of technical education at some college or university as a preparation for the clay-working business.

Each year one of the ablest men is selected president. It is certainly wise to continue these men upon the executive committee after the expiration of their terms as president, as it thereby insures the best interests of the association being well taken care of.

The relative merits of the Simpson Brick Press and the Boyd Press formed a never-ending topic for discussion between young Simpson and John Maroney. When we left Chicago, neither had succeeded in convincing the other that he was wrong.

THE NATIONAL ASSOCIATION OF BUILDERS.

ON Tuesday, Wednesday, and Friday, Feb. 13, 14, and 16, the Eighth Annual Convention of the National Association of Builders was held at Cotillion Hall in the Mechanics' Building, Boston. The first day was largely taken up by routine business, but was characterized by Secy. Sayward's very able report, Mayor Matthews's address of welcome, and some lively discussion. After the committee on credentials had reported, it was found that ninety-five delegates were on hand. The important matter of the afternoon was the secretary's report, a long but very well prepared one, setting forth clearly the work of the association, and suggesting sundry directions for improvement. A motion to refer the report to a committee brought a Mr. McCarthy, of Chicago, to his feet, with a general denunciation of the association, and particularly its secretary, in the course of which he defied any member to name a single thing the association had accomplished. This brought Mr. Anthony Ittner up, but Mr. McCarthy insisted upon holding the floor, and before Mr. Ittner secured the chairman's recognition Mr. McCarthy had been apologized for by Mr. Stevens of Philadelphia, and his remarks had been repudiated by Mr. Ginderle, another delegate from Chicago. Mr. Ittner then took the floor, and made a very forcible criticism of Mr. McCarthy's position. The remainder of the afternoon was taken up with a large number of resolutions and reports. We regret that lack of space does not allow of our printing the secretary's report; but as it will be printed by the association, and published in other journals, we would refer our readers to these, with the remark that it is a paper well worth looking up and reading.

WEDNESDAY SESSION.

The chief topic for discussion during this session was arbitration, Hon. Carroll D. Wright, United States Commissioner of Labor, giving an address on "The Relations of Employer and Workman."

The attendance was a little larger than the day before, some snowbound delegates having reached the city. The first business of importance was a resolution introduced by Mr. Watson of Philadelphia, on the death of Col. Richard T. Auchmuty, the founder and maintainer of the New York trade schools. Mr. McCarthy of Chicago, Mr. Harris of Philadelphia, Mr. Wright of New York, Mr. Ittner of St. Louis, Mr. Blair of Cincinnati, and others eulogized Col. Auchmuty. Resolutions were also adopted on the death of James Boland of Buffalo, N. B. Hussey of Omaha, Hugh Sisson of Baltimore, and B. D. Whitcomb of Boston.

After the intermission for lunch, Hon. Carroll D. Wright was introduced.

MR. WRIGHT SPOKE

in favor of arbitration, but called attention to the fallacies of compulsory arbitration. He outlined the difference in the labor question between the present time and a generation ago, when it was merely a matter of wages and time. To-day it involves many important considerations, psychological, sociological, and industrial. It is a question which reaches every interest of man, which is as many-sided as the minds of men. Therefore, it is necessary to devise some method of harmonizing different bodies to one line of action; hence the value of true arbitration. With all that has been said of compulsory arbitration, it is a step backward. It means the enslavement of all the personal elements of industry. It would result in a more narrowing system than the Feudal. It means the development of the fighting nature of men. It means the death of industry. True arbitration brings men together for the purpose of comparing views and settling difficulties. It dignifies and ennobles industry, and embodies in its principles the reciprocal relations of men. To establish arbitration is to elevate the reciprocal relations to a plane of mutual recognition of the rights of all.

Individualism, which was the ruling spirit years ago, is supplanted by altruism. We have developed from a condition of fixed relation to one of contract, by which a workman can make such an arrangement as he chooses. Labor difficulties cannot be settled until each man recognizes the rights of the other man. The time is coming when neither party to a strike or lockout will feel that he is doing the right thing. Mr. Wright described the methods of compulsory arbitration and gave many illustrations to show its fallacy. He said that our mechanics have been taught they are free; they have been taught the principles that surround governments; they have been studying economic relations. Notwithstanding the objectionable features, one must recognize that in strikes and in lockouts there is much that is right on both sides. This results from the attempt of man to get the best of what he can out of his environment. "You should have a perpetual court of arbitration, to which you can refer. If you have a judiciously selected board of members on both sides of the great problem of industry, you have taken a great step towards the right; for you have recognized the rights of men, and those men have become just so much better as a result."

IN THE DISCUSSION WHICH FOLLOWED

Mr. Harris of Philadelphia said that the experience there was strongly in favor of arbitration. He instanced the good that had been done in the case of an association of bricklayers, independently organized, which had been brought to recognize the benefits to be derived from arbitration, after causing the builders no end of trouble by sudden strikes. There had been no friction since. Mr. Harris thought the workmen had more right to organize than the builders. Mr. Ginderle thought it became the employers to make more concessions than the employees did. He stated that in Chicago there had not been a masons' strike since 1887, when they first began to arbitrate. He advised arbitration before, not after, the difficulty. Mr. Blair of Cincinnati, chairman of the committee on arbitration, urged the formation of the several trades in each city into compact organizations, which could treat successfully with the men in their employment, who are strongly organized.

Mr. Sayward then explained

THE FORM OF ARBITRATION

of the association, and said he introduced it in order to bring out any suggestions leading to its improvement. He said the spirit of the agreement was the spirit of Mr. Wright's address, and asked why exchanges have done nothing with the agreement, which was the careful work of a capable committee. The convention ought to endorse it and instruct the filial bodies to introduce it. Mr. Hussey announced that he was in full accord with the spirit of arbitration, but wished to make the point that arbitration had no business to concern itself with the right of a non-union man to work, which was guaranteed him by the Constitution. He was in the same position as at the first session of the association. He held that no man and no body of men, whether master builders or union organizers, have the right to say that men shall not have the right to work, or that men shall not have a right to learn a trade.

Mr. McCarthy of Chicago was again heard from, as he promised the convention the day previous he should be.

Mr. Woodbury spoke with two years' experience on the arbitration committee, which has treated with bricklayers', stone masons', and laborers' unions. To his mind the form of arbitration proposed was the best way of settling all vexed questions that came before the board. There had been no strikes or lockouts of importance since the committee had been in existence.

Mr. Baker presented a resolution to the effect that delegates should urge upon their respective bodies the adoption of the association's form of arbitration. This was seconded by Campbell & Hopper of New York, with favorable instances of the force of arbitration, also by Mr. Sayward, and unanimously carried.

A large number of resolutions was referred to the committee on the same. Greetings from the National Association of Building Inspectors, in session at Steinert Hall, were received; and a vote of thanks was passed to the Massachusetts Charitable Mechanics' Association for the use without pay of Cotillion Hall.

FRIDAY'S SESSION.

VOLTA BUREAU BUILDING. BALUSTER.

This, the closing day of the convention was in many respects the most important, as the subjects of trade schools, the uniform contract, and the per capita tax were considered, and the election of officers was held.

Mr. Watson of Philadelphia and Mr. Ittner of St. Louis presented resolutions recommending the establishment of trade schools, Mr. Ittner asking members to obligate themselves to give young men graduating from such schools a finished trade in event of proscription by trades unions. Resolutions were finally adopted to the effect that the character of the work of the National Association is largely educational, and should not be limited to any one class; that the trades unions display antagonism to the association's plan for educating apprentices primarily on account of lack of understanding of trade schools; that the National Secretary be instructed to prepare a description of the plan, setting forth the fact that the time occupied by a course of trade training shall be deducted from the full term of apprenticeship, and that the remainder of the term shall be served in acquiring the necessary manual dexterity; that proper means for the distribution of this description among the workmen be taken, and that their co-operation with employers be urged in the establishment of trade schools.

The Uniform Contract was discussed with considerable vigor, but some of the speakers seemed to overlook the fact that there are two parties to every contract. For instance, Mr. Grace of Chicago thought amendments should be made without reference to the American Institute of Architects. The latter might kick, but they would have to come to terms finally. But in the majority of cases the speakers thought that the aim to secure in this contract was a thoroughly fair relation between the parties in a building contract. The matter was discussed until the dinner in the lower hall grew cold, and finally tabled. Mr. Sayward suggested that if all delegates who had suggestions to make would send them in writing to the committee much good would be accomplished. After all, as Pres. Hersey remarked on opening the discussion, the action of the convention was prescribed. The only action which could be taken was to recommend the delegates to the joint committee on uniform contract to urge the adoption of changes which, after discussion, were approved by the convention.

A vote on the per capita tax resulted in the adoption of three dollars by a small majority. Secy. Sayward favored reduction to two dollars on account of hard times, and offered to work for a fraction of his present salary to reduce expenses so that the lower tax would suffice.

Mr. Wingate introduced a resolution restricting immigration, which was opposed on the ground that the American boy can look after himself, and finally tabled.

The election of officers resulted as follows: President, Noble H. Creager of Baltimore; first vice-president, Charles A. Rupp of Buffalo; second vice-president, James Meathe of Detroit; secretary, William H. Sayward of Boston; treasurer, George Tapper of Chicago.

Mr. Creager, the president, belongs to the large brick manufacturing firm of Pitcher & Creager of Baltimore. He is the president of the Baltimore Exchange, and is very prominent in Baltimore business circles.

Mr. Meathe is a plumber, and president of the Detroit Exchange.

It was voted to hold the next convention at Baltimore on the third Tuesday in October, 1895. In the evening a smoker was given by the Boston Exchange, and delegates and visitors royally entertained. A banquet to the visiting ladies was held the same evening at the Vendome.

COMMISSIONERS AND INSPECTORS.

THE fifth annual convention of the National Association of Commissioners and Inspectors of Buildings was opened at Steinert Hall, Boston, on the morning of the 13th of this month.

Pres. John S. Damrell of Boston was in the chair. Mr. J. J. Barry of Boston presented a paper on the "Responsibilities, Qualifications, Duties, and Powers of Building Inspectors." In this Mr. Barry stated that a building inspector should have the same power to arrest transgressors of the law that a police officer has. Such power, he claimed, would make a man conservative, and injudicious use of it would be suitable cause for his removal.

Several inspectors stated that they had similar powers, and could at any time arrest work on a building, and that no building could be erected without their permission.

Inspector Entwistle of Washington read a paper on the buildings of that city, which was followed by a paper on the "Tower Fire Escape" by Mr. William J. Gillingham of Philadelphia. This was essentially the same paper contributed by Mr. Gillingham to our last month's number, and its discussion occupied the remainder of the morning session. It was received very favorably, and strongly endorsed by many of the inspectors. The subject of this form of escape will be further considered in future issues of THE BRICKBUILDER, in the department devoted to fireproofing. At the afternoon session Mr. Fitzsimmons read a paper on the "Relation of the Architect to the Building Department," which was warmly approved by the convention.

On Wednesday the Arsenal at Watertown was visited and the big testing machines inspected. Bunker Hill and the Navy Yard were taken in on the way back.

THE BRICKBUILDER.

AN ILLUSTRATED MONTHLY DEVOTED TO THE ADVANCEMENT OF ARCHITECTURE IN MATERIALS OF CLAY.

PUBLISHED BY

The Brickbuilder Publishing Company,

CUSHING BUILDING, 85 WATER STREET, BOSTON.

P. O. BOX, 3282.

Subscription price, mailed flat to subscribers in the United States and Canada	$2.50 per year
Single numbers	25 cents
To countries in the Postal Union	$3.00 per year

COPYRIGHT, 1893, BY THE BRICKBUILDER PUBLISHING COMPANY.

Entered at the Boston, Mass., Post Office as Second Class Mail Matter, March 12, 1892.

THE BRICKBUILDER is for sale by all Newsdealers in the United States and Canada. Trade Supplied by the American News Co. and its branches.

PUBLISHERS' STATEMENT.

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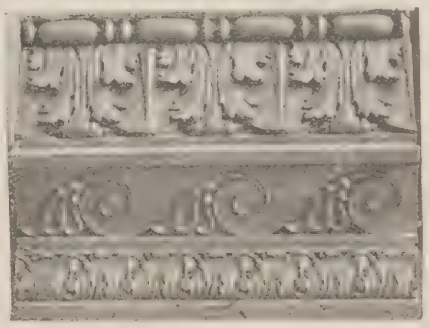
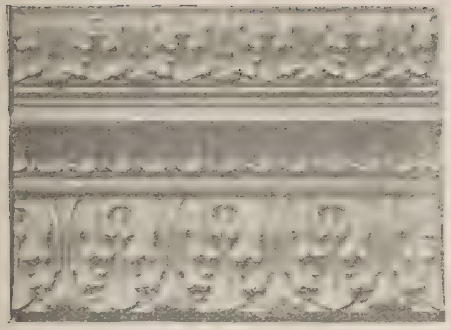
CROWN MOULD. VOLTA BUREAU BUILDING.

WE wish many of our architectural readers who are possessed with the idea that the brickmaker is very little higher in the industrial scale than the day laborer could have attended the Chicago convention. They would have found there as fine a body of representative business men and manufacturers as any industry in the United States could show. The brickmaker of to-day is a manufacturer in the highest sense of the word. Producers of lumber and stone, raw and finished, have comparatively few of the difficulties to contend with that the manufacturers of clay goods are constantly meeting. The obstacles of this industry, in forcing the manufacturers to overcome them, have developed a class of self-reliant, successful men that everywhere hold leading positions in the industrial world.



BELT COURSE. VOLTA BUREAU BUILDING.

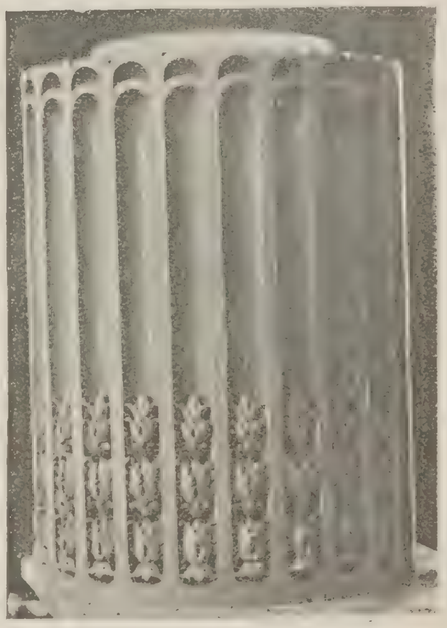
WE also wish to invite our architectural readers to read carefully the papers by Mr. Miller and Mr. Engle, on glazed and enamelled brick, published in this issue. What is therein contained is of vital importance to every architect, as the necessity for using glazed materials is increasing day by day. It can be said in this connection that



CORNICE OVER FRONT ENTRANCE DOOR.

these papers held the attention of the convention in a manner which proved beyond question the soundness of the views put forth in them.

THE desirability of some course in technical education as a preparation for the clay-working business has often been advocated in these columns, and we are pleased to note that the Chicago convention considered it with decided favor. Mr. Orton's paper, which preceded the discussion, is published in full in this issue, and ably sets forth the reasons for such a preparation and the ways in which it may be useful. It is a matter that we recommend to the governing bodies of technical schools, with a suggestion to look into the extent of the clay-working industry. We can think of no other representing so large an investment of capital, and so great a value of products, for which preparation is not provided by some one of the technical or scientific institutions; and yet it is an industry where special knowledge is indispensable.



DRUM OF COLUMN. VOLTA BUREAU BUILDING.

IT is encouraging to note that the sentiment of the National Association of Builders was opposed to the views advanced by some speakers when the uniform contract was under discussion, to the effect that the American Institute of Architects should be forced to come to terms and accept changes introduced by the Builders. This appears to us not only a one-sided, rather pig-headed way of looking at the matter, but one that is absolutely foolish, in that the architects have, and probably always will have, the whip hand. Competition is so strong that architects will have no difficulty in securing honest and capable builders to take contracts, the terms of which are fair. The view of Mr. Grace of Chicago should have been condemned by the National Association. It throws out the question of fairness altogether, and we are led to wonder whether Mr. Grace has not run up against some architect who insisted upon a contract being carried out according to specifications.

COMMUNICATION.

EDITORS OF THE BRICKBUILDER:

Dear Sirs, — In reading Mr. Boyden's article on "Hollow Brick Walls," in the December number of your paper, I was impressed by the following statement, and particularly by the part printed in italics (which are mine): —

"From exhaustive tests made during the building of the Allegheny County Court House and tower, — a most important work, the tower being three hundred and twenty feet high, — it was ascertained hat the strength of brick built in walls or piers is very nearly one third of the crushing strength when crushed between smooth surfaces, or imbedded in plaster; so that, in work where it is necessary to be near the margin of safety, *it may be assumed that well-laid brickwork will carry in a wall one third the crushing strength of a single brick.*"

It would prove interesting reading to many of your subscribers, I think, if a description of the above-mentioned tests were given, as the conclusions based upon them are certainly at variance with other tests and the practice of engineers. It may be that part of the brickwork in the above-mentioned tower carries twenty-four tons per square foot, although it seems improbable; and in any case, I do not think it is a safe load to place upon even the best of brickwork.

As the assumption of Mr. Boyden, printed in italics, is certainly contrary to results obtained from a large number of tests made on the crushing strength of brick and brick piers, at the United States Arsenal at Watertown, Mass., and as the general tendency of Mr. Boyden's article is to attribute a greater strength to brickwork than seems to be warranted, I would like to call attention to the following facts, which have been developed from various tests made on the strength of bricks and brick piers.

First. In the tests on the strength of seven brick, published in Mr. Boyden's article, it should be noticed that in every case the brick *cracked* under less than one half of its ultimate strength, and brick No. 3, which, was next to the strongest of the seven, cracked under only thirty-five per cent of its ultimate load. The same condition is shown by nearly every set of tests on the strength of brick that I have seen.

Second. Tests on brick piers built of Sand's Cambridge (Mass.) brick (the results of which are given on page 178 of the *Architects' and Builders' Pocket-Book*, ninth and later editions) show that the strength of carefully built brick piers averages one tenth of the strength of a single brick, when built of common brick, in lime mortar, and about one sixth when built of pressed brick.

Piers built of common brick in Portland cement mortar were one fifth stronger than those laid up with lime mortar.

Besides the small ratio which the strength of the pier bore to the single brick, every one of the piers built of common brick commenced to crack under a load of less than one half of its ultimate load, so that the cracking strength per square inch of the piers built of common brick in lime mortar only averaged about one twentieth of the strength of a single brick. But we do not wish our piers to crack, and it would hardly be considered safe to load a pier to more than one third of its cracking strength, or *one sixtieth* of the ultimate strength of a single brick.

The average crushing strength of the seven bricks given in the table quoted by Mr. Boyden is approximately eighty-three hundred pounds per square inch, and one sixtieth of this would give one hundred and thirty-eight pounds per square inch for the working strength of the brickwork, or nine and nine tenths tons per square foot.

This value is a little more than that generally used by engineers for brickwork in lime mortar, or that given in the recent building laws.

The following tables give the greatest allowable load for brickwork, as specified in the Boston and Chicago building laws.

Boston Law. — Maximum load in tons per square foot: —

	WALLS.	PIERS, 6 to 12 DIAMETERS.
Brick laid in cement and sand, 1 to 2	15	13
" " " cement, lime, and sand, 1, 1 and 8,	12	10
" " " lime mortar........................	8	7

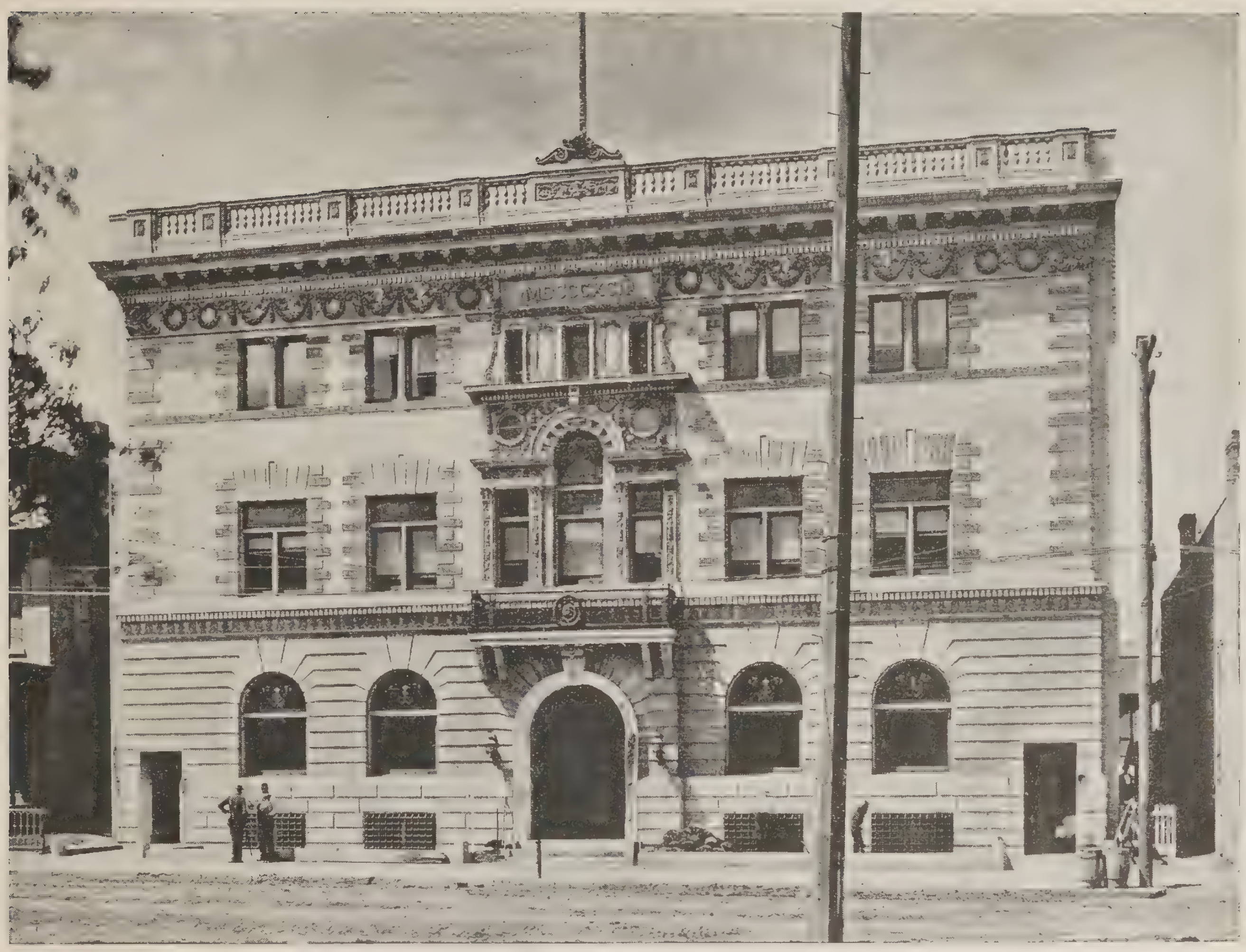
Chicago Law. — Maximum load in tons per square foot for brickwork in walls: —

Brick laid in standard cement mortar........................	12½
" " " ordinary cement mortar........................	9
" " " lime mortar........................	6½

On page 181 of the *Architects' and Builders' Pocket-Book* (ninth and later editions) the writer gives values for the working strength of brickwork, which agree very closely with the above.

Regarding the advantages of hollow walls, I believe them to be better than solid walls, when bonded with metal ties, and when not exceeding three stories in height; above that height I should prefer to use solid walls, lined with terra-cotta furring blocks.

F. E. KIDDER.



THE EUREKA CLUB, ROCHESTER, N. Y. MESSRS. NOLAN, NOLAN & STERN, ARCHITECTS, ROCHESTER.
SEE PLATES 14, 15, AND 16, ALSO DESCRIPTION BELOW.

THE ILLUSTRATIONS.

PLATES 9, 10, 11, 12, and 13. ELEVATIONS AND DETAILS OF THE VOLTA BUREAU, Washington, D. C. *Messrs. Peabody & Stearns, Architects, Boston.*

This is one of the richest examples of terra-cotta work in this country. The ornament is not only well designed but admirably applied, and made to count for something by the plain, unbroken surfaces of the walls. Just what the detail is may be seen by the photographs reproduced on the preceding pages, which show nearly every decorative feature on the building. The terra-cotta work was executed by the Perth Amboy Terra-Cotta Company. The bricks from which the building is built were made by the Partridge, Powell & Stone Company, the corporate name of which was on Jan. 31 changed to the Excelsior Terra-Cotta Company. This company now combines the manufacture of architectural terra-cotta, in all colors, with the special colored front brick that has heretofore been its principal product, thus enabling architects to purchase brick and terra-cotta of one factory, insuring a successful combination of colors as well as avoiding the annoyance of making two contracts for materials so closely related. Our best wish to the Excelsior Terra-Cotta Company is that the same success attend this combination that has characterized a similar combination in other cases. The company's offices are at 105 East 22d Street, New York.

PLATES 14, 15, and 16. ELEVATION AND DETAILS OF THE EUREKA CLUB BUILDING, Rochester, N. Y. *Messrs. Nolan, Nolan & Stern, Architects, Rochester. Drawings by J. Mills Platt.*

There may be many larger and more extravagantly furnished clubs than the Eureka of Rochester, but there are few more complete and thorough in their appointments. From top to bottom every care has been exercised by the architects to get the most perfect results; and, as the fame of this building is already established, we have gone to considerable trouble to secure the names of the more important sub-contractors, that our readers in that section of the country may profit by the information when they have similar work which requires careful and conscientious execution.

First that claim attention are the materials of clay from which it is made. The Peerless Brick Company of Philadelphia furnished all front and special shape brick, as they have already done for a long list of buildings throughout New York State. The rich terra-cotta detail was executed by the Corning Terra-Cotta Company of Corning, N. Y., and is the best kind of evidence that this company is in line for the best class of architectural terra-cotta.

The Rochester Brick and Tile Company furnished the common brick, tile, etc. The mortar of the front brick and terra-cotta work is buff, colored with the mortar color made by the Ricketson Mineral Paint Works in Milwaukee, Wis.

Messrs. Whitmore, Ranler & Vercinus of Rochester supplied the cement manufactured by the Buffalo Cement Company, and also laid the cement walks and cut and finished the Gouverneur marble.

Messrs. A. Freiderich & Sons, 601 Ellwanger & Barry Building, and F. C. Seitz, 605 same building, did the general and mason and the carpenter contracting, respectively. The Messrs. Freiderich are also the contractors for a new $70,000 building on Platt Street, Rochester, for C. B. Woodworth.

The Tennessee marble wainscot, lavatory tile floors, tile and Pompeiian brick fireplaces and fittings, were furnished and set by J. C. Barry, 49 North Street.

Of the iron work, the structural was done by J. J. Young of Rochester, the ornamental by the Winslow Brothers Company of Chicago.

The inside finish and mill work was contracted for by John A. Smith, 175 Exchange Street, and the furniture was specially designed and made by the Hayden Furniture Company of Rochester.

It is upon them and the other interior furnishers given below that much of the success of the club depends; for the furniture, draperies, carpets, chandeliers, etc., in the large reception, dining, and ball rooms, the ladies' parlors, and the general club rooms, produce the strongest impression upon members and visitors. With the two above-mentioned houses must also be catalogued Howe & Rogers of 80 to 84 State Street, who put in the carpets and rugs; Gorton & McCabe, 43 State Street, who furnished the draperies and hangings; Albert Will, 28 Exchange Street (C. K. Summerhays, manager), from whom the gas and electric features were secured; Hamilton & Mathews, 26 Exchange Street, who supplied the hardware (a very important part of a fine building); and Henry Waltjen of 38 Exchange Place, who did the painting and decorating.

Of course the Graves elevators were put in, for why go away from home to get work other cities send there for? The same company also furnished the dumb-waiter service.

In a well-appointed club building like this there is much that is out of sight, often inaccessible, that must be put in to stay. One of the most important contracts of this sort is the electric instalment, for lighting, for bells, and often for power. Messrs. R. Schmitt & Co. of 51 East Main Street were intrusted with this work. The plumbing, while not inaccessible, is nevertheless a nuisance if put in so that access for repairs is often necessary, and the selection of W. G. Reid & Sons for such work as is here required is a decided compliment to their skill. Not less important is the steam heating, which was installed by Samuel Sloan, 24 Exchange Street; two boilers from the Sterns Manufacturing Company of Erie, Pa., and a large blower system by the B. F. Sturtevant Company of Boston, are the principal features of the plant.

Club men are good livers, and a club so well appointed in other respects as the Eureka must needs have a kitchen with every modern convenience. C. W. Trotter & Son, 46 North Clinton Street, Rochester, attended largely to this portion of the building, putting in a twelve foot, three-fire French range, copper cooking utensils, a carving-table, and a thirty-inch broiler. The refrigerators, meat boxes, and cool rooms were built in by the Wickes Refrigerator Company of Chicago. The firm of Goggan & Knowles, 50 Franklin Street, Rochester, did all the sheet metal work, and roofing.

One more feature needs to be mentioned, — the bowling-alleys and gymnasium in the basement; the former of the kind patented by Emil Reiskey of Rochester, and made with the gymnasium appliances by the Narragansett Machine Company of Providence, R. I.

The Eureka Club is about twelve years old, and has always been a prosperous, well-managed organization. It has at present 159 active members, comprising the best and most prominent of Rochester Jewish citizens. Mr. Abram Dinkelspiel is the president.

MESSRS. FISKE, HOMES & CO. treated the delegates to the National Builders' Convention to a very fine display of their specialties. There were three very noticeable things in the way of faience that attracted marked attention, — a large mantelpiece, a panel similar to the ones used in the Reading terminal at Philadelphia, and a frieze and ceiling decoration. Smaller pieces were advantageously displayed, so that, with the faience counters and railings that are a part of their office furniture, this material received a good demonstration of its possibilities. In the line of fire-flashed and Pompeiian terra-cotta some interesting exhibits were shown, and the application of Pompeiian bricks in special sizes to the construction of fireplaces was illustrated by several carefully built examples in varying shapes and sizes.

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THE AGE OF CLAY AND STEEL.

AT the banquet given by the Chicago Association to the National Brick Manufacturers' Association, the following toast by Mr. W. L. B. Jenney of Chicago calls for a leading place in this department: —

"*Mr Toastmaster, and Gentlemen of the National Brick Manufacturers' Association,* — 'What is a brick?' was the favorite question with a celebrated French professor of engineering, whom I once knew. His students soon 'caught on' to the only answer that the old gentleman would accept, under any circumstances.

"'A brick is a parallelopipedon of baked earth.' Any other form was terra-cotta. For him there was no such thing as an ornamental brick.

"I am informed that your society entertains a much broader view, and admits in its membership all the manufacturers of clay for building purposes. Those of you who are not so fortunate as to be residents of Chicago no doubt have remarked sundry peculiarities in our city. Most notable, perhaps, is the extreme modesty of the Chicago citizen. This is no joke.

"When a Chicago capitalist or a Chicago syndicate decide to erect a big sky-scraper, they do not brag about it for months, attracting attention to themselves on account of their wealth and their enterprize. Their modesty is such that the first intimation they give the public is a notice in the real estate column of the Sunday papers of a transfer of a big block of property, a cut and description of the building, and the name of the fortunate architect.

"The next morning, when that architect reaches his office, he will find waiting for him the representatives of the brick manufacturers of the neighborhood, each anxious, then and there, to make a contract for the brick of that building.

"Chicago is always short on time. We cannot afford to put a lot of stone-cutters at work pecking away at big blocks of granite, and spending two or three years in the erection of a building. The carrying charges are so enormous, consisting often of the interest on more than two millions of dollars, besides taxes, insurance, etc., that the whole thing must be done in twelve months from the turning out of the old tenants, the tearing down of the old structure, the erection of the new, to the installing of the new tenants, that a revenue may begin. We must have materials that can be manufactured by machinery; great quantities in a very short time. Clay and steel adapt themselves most admirably to these requirements. We must have a style of construction that can be erected rapidly, and so arranged that if the terra-cotta of the lower stories is not ready, which is usually the case on account of the excess of work in these stories in the shape of columns and other ornamentation, the setting of the terra-cotta can commence in the second or third stories without waiting for those below. The Chicago steel skeleton construction meets these requirements.

"In these tall buildings the skeleton is of steel. The walls, the floors, the partitions, are carried story by story, each story independently on the columns. The carrying lintels and brackets are wrapped around with clay in the shape of ornamental string courses and medallions. Terra-cotta pilasters cover the exterior columns. The plain surfaces are filled in between with pressed brick or terra-cotta ashlar. The whole is backed up with clay in the shape of common brick. The floors are of steel beams filled in between with hollow clay arches. The partitions are of clay tile. The fire-proofing is of clay. The whole is cemented together with another form of clay, for cement is little more than clay roasted and ground. So that we are entering upon a new building era, — an era of clay and steel. There was a stone age, — an age of savagery. Then followed a bronze age, — an age of barbarism. Then came the iron age, — the age of civilization. And now we enter upon an age of steel and clay, — an age of science, an age of advanced civilization, in which the technic arts are making most enormous strides.

"These great buildings of clay and steel are in every respect superior to the old style of masonry construction. They are fire-proof, cyclone-proof, and earthquake-proof. They are very substantial, and, moreover, are economical. These buildings are calculated and designed with the same science, the material is inspected with the same care, the construction is superintended with the same thoroughness, as in a great railway bridge of the first order across the Mississippi or Niagara. To some extent these buildings resemble the human figure. The bones and the sinews are of steel, the flesh and the ornamental exterior of clay. All the art, all the architecture, and all the beauty are in the clay. That this society should have chosen rather the beautiful exterior instead of the bones of the structure is easy to comprehend; one has only to glance around the room. By way of illustration, permit me to say that I am sure that there is not one of you but what would choose rather the rosy cheeks and coral lips of a beautiful, blushing maiden in preference to her bones."

THE *Wall Street Daily News* says that cheap building materials, principally those which go to make up a fireproof building, are causing an epidemic of tall office and apartment buildings. Ten years ago a strictly fireproof building would cost fully two dollars per cubic foot. But, with improvements in manufacture, the cost of steel for the framework and hard or porous terra-cotta for covering has steadily dwindled until the cost is now only about thirty-five or forty cents per cubic foot. Taking Mr. Kidder's recent article in the *American Architect* as authority, this is an adequate figure for a strictly fireproof building, that is not extravagantly decorated on interior and exterior. Of such buildings we can select, as fair examples, the Auditorium, Chicago, costing thirty-six cents; the Stock Exchange in the same city, 33.2 cents; the Schiller theatre, also in Chicago, 30.8 cents. These are all by Adler & Sullivan, who, like other prominent Chicago architects, are past-masters in the art of fireproof construction. Taking these as a basis, it is not unreasonable to place the cost of the average steel frame fireproof building at thirty cents; for it is not likely that materials will increase in cost. On the other hand, it is more than likely that their cost will be still further reduced. According to Mr. Kidder's figures, this is only twice the cost of a good-sized brick house with ordinary finish. A house, however, could be rendered practically fireproof with much less expense than a large office building, provided special materials did not have to be made.

As yet, however, judging from published lists of various fireproofing companies, only an occasional residence has been built of fireproof materials. In the construction of residences porous terra-cotta is particularly suitable. It is extremely light, a non-conductor, can be cut with edged tools, and holds nails and screws. As a protection to wooden construction it is admirable, and it can be made in slabs or boards, which can be cut to fit any desired space, and nailed into place, the plastering covering and protecting the nails.

Porous terra-cotta seems easily enough made, but those who attempt its manufacture with ordinary brick clay are pretty certain to meet with failure. The successful manufacturers use *fire clay* with some combustible material, usually sawdust. With a clay that vitrifies at a low heat there is danger that the combustion of the sawdust will generate heat sufficient to vitrify easily burning clays, and the product will not possess the desired spongy or porous character. We firmly believe that thorough methods of fireproof construction will extend in a short time to the better class of residences. In large warehouses, where it is of the greatest importance, the tendency is still to reduce expense by the use of certain methods of slow-burning construction. These are almost as expensive, if carefully carried out, as thorough fireproof construction; and they seldom serve to save the building when a fire once gets started. It can be said in their favor that they are less a menace to surrounding property, but they are seldom successful in saving themselves or their contents from destruction.

TRADE NOTES.

WE were glad to note at the convention that the subject of enamelled bricks received a good share of attention, and much general interest was shown in the discussions that followed upon the subject; also the disposition of our manufacturers to enter the field with an article equal in all respects to that of foreign make. The Tiffany Pressed Brick Company of Chicago are turning out an enamel brick that is receiving very favorable comment, being white and clear, with a highly finished surface and possessing great durability. They guarantee the brick equal in every way to any manufactured, not excepting the imported article.

IT is encouraging to note the increased popularity which fireproof construction is earning for itself, its use being extended to nearly all grades of buildings.

In response to the demand from the architects and owners for fireproofing adapted to residential purposes, the manufacturers are putting forth some new ideas that are meeting with deserved favor. We have had our attention called to the new one-inch hollow tile for partitions, etc., that the Pioneer Fireproof Construction Company are now putting on the market. These tiles are designed especially for residential work and flats where economy in space and cost is desired. The company report a rapidly growing demand for them.

WE note that the architects are giving more attention generally to selection of colors in mortar, and securing some very pleasing effects by proper choice. We feel that a great deal can be done in this direction, and are glad to know that it is interesting the profession more than formerly.

Some very fine specimens in mortar color are being put upon the market by the Ricketson Mineral Paint Company of Milwaukee, Wis. They claim absolute fastness of color in all their goods; also that their material can be handled forty-eight hours after mixture, not hardening in that time. The popularity of their brand would seem to warrant the claim. Besides the straight colors, they make a feature of special shades manufactured to order.

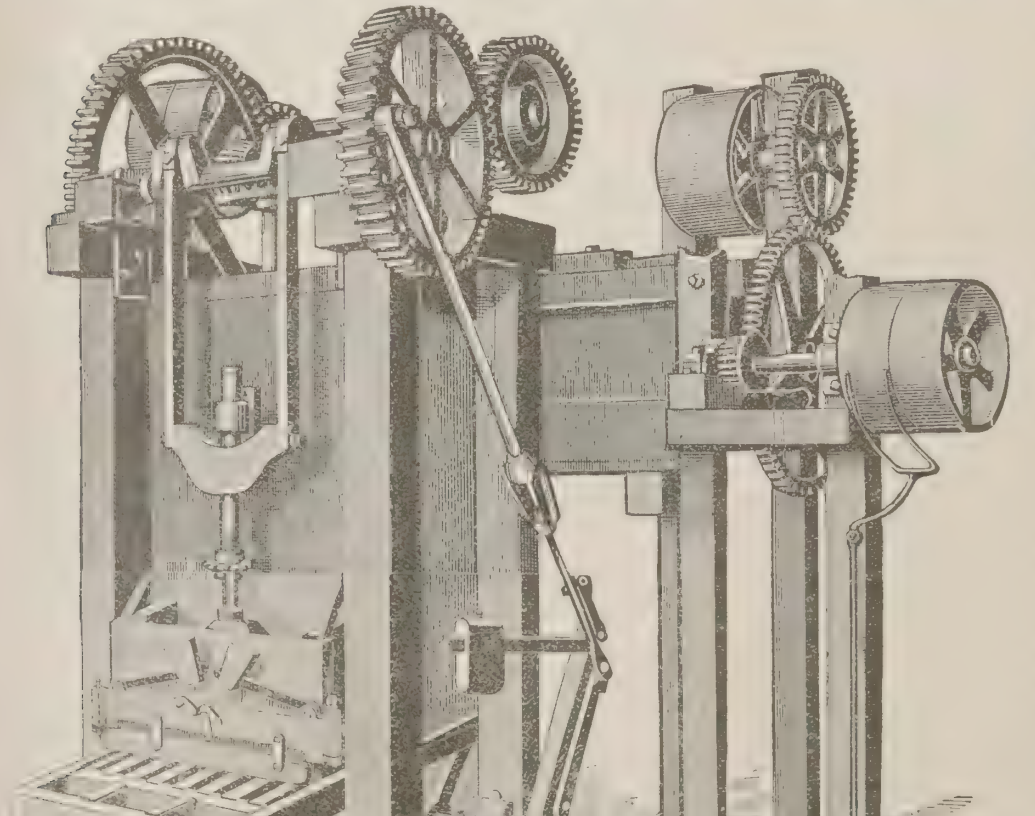
A handsome shade of their buff mortar color appears in the structure of the Eureka Club House, the half-tone print of which will be found on page 29.

ON page v appears the advertisement of the Simpson Brick Press Company. This concern are the manufacturers of the celebrated Simpson presses, and notwithstanding the financial depression report business as being good. They have recently constructed several large plants in the East, and are figuring on many more.

Those intending to embark in the dry press process of making brick would do well to correspond with this firm, as their machinery is well known to be of the highest quality. As further evidence of the superiority of their line, they were given nine points of advancement in dry press brick machinery by the official judge on that class of machinery at the World's Fair.

WE have recently had the pleasure of visiting the Chemical Sand Brick Works, owned by Mr. W. H. Lathrop, of Racine, Wis. It is a model plant of its kind, having all the latest improvements in machinery for the production of chemical sand brick, and this past year has turned out some half million handsome specimens of the same. Mr. Lathrop claims for these bricks all the virtues of a desirable building brick, laying particular stress on the quality of the increasing hardness of the bricks with lapse of time. He further states that he will guarantee them for any reasonable term of years. They are made in any desired design or color, and present a very handsome appearance wherever used.

Mr. Lathrop reports a growing demand for his production, and has some very flattering testimonials from architects and builders who have used his bricks.



THE cut on this page is a representation of the new, and latest improved brick machine, patented by George Carnell, having a horizontal pug mill attached, and a patent throw-out motion, which pushes out the moulds. When a mould gets caught, or a stone gets fastened in the machine, this catch will open, and thus all danger from breakage is avoided. It is superior to any other machine in use for taking the clay direct from the bank, tempering it, and making good, straight, and solid stiff mud bricks.

In the construction of this machine the aim of the inventor has been to relieve the crown wheel and tempering shaft of as much strain as possible. The result is that the crank shaft acts independently of the tempering shaft, thus distributing the strain on two vital movements. The benefit of this arrangement is apparent; the only work required of the pug shaft is the tempering of the clay, the motive power of the crank shaft being directly from the counter shaft; thus the machine is capable of working the clay very stiff without endangering the crown wheel or shaft. The machine is powerful, durable, and simple in its construction and does not require much skill in handling. The working parts are well protected from dirt and sand and can be easily duplicated. The plunger is regulated with a screw, thus insuring the greatest speed and exactness. Each machine is thoroughly tested before leaving the shop and is sold entirely on its merits.

THE BRICKBUILDER

VOL. III. BOSTON, MARCH, 1894. No. 3.

GOTHIC ARCHITECTURE IN BRICK.

From Chabat's "Brick and Terra-Cotta."

ITALIAN architecture of the mediæval period does not present in its development the abrupt changes which we see wrought in certain other countries; the change from one characteristic form to another is made with more caution. If we would consider buildings in which the semicircular is everywhere replaced by the pointed arch, we must turn to Northern Italy to collect the greatest number of examples of the use of terra-cotta. In this region, where the soil is so rich in deposits of clay, the architects understood the advantage of this material as compared with stone, in the way of cheapness and its adaptability to modelling. Admitted, that clay does not make possible in terra-cotta decoration the finish within reach of the sculptor's chisel, on stonework, it nevertheless is adequate for every general effect, and especially so when it is not desired to obtain simply a collection of fine and exact details, but a vigorous sketch, harmonious, and consequently capable of producing a strong impression.

These qualities we find united in certain edifices in Italian cities; Pavia, for example, contains some very remarkable brick buildings of the fourteenth century. The church of Santa Maria del Carmine, built in 1373, is of brick, with a foundation of stone; the joints of the masonry are very carefully made, a fine quality of mortar being used; the projections of the ornamented parts, such as cornices, belt courses, and arch moulding, are handled with such nicety, the sculptures are worked with so much taste, that the effect upon the spectator is striking. The entablature of the gabled façade especially merits attention. It shows (Fig. 1) in its arcade motive of decoration, its arabesque, its rope mouldings, *et cetera*, a very beautiful use of moulded terra-cotta. The columns and piers of the interior are also brick, laid with so much care that the cylindrical form of the shafts appears perfect; one can scarcely distinguish the joints.[1]

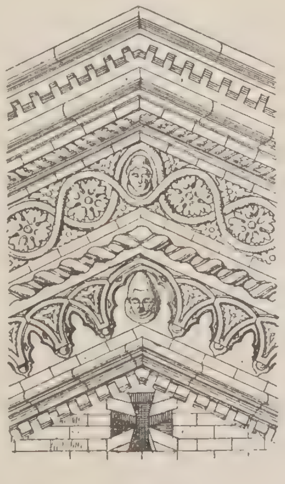


FIG I.

This building presents in its entirety a great uniformity of color, which is due to the exclusive use of terra-cotta. It is different with the Castle of Pavia, built by the Visconti, two great towers and some arches of which now remain: brick and terra-cotta entered largely into the construction and decoration of this building, but the columns, capitals, and some cornices were stone. Fresco imitations of marble added, by their brilliant colors, to the variety of the decoration.

If the brick buildings of the Middle Ages are not so important in other provinces of Italy as they are in Lombardy, we find nevertheless in a large number of cities, such as Lucca, Pisa, Siena, Ferrara, Ravenna, Bologna, Rome, etc., buildings of this kind possessing the greatest interest. We cannot mention them all; only some few can we describe.

At Pisa, the tower of the Vicolo Santa Margherita has arches of modelled terra-cotta; another tower named from the Via delle belle Torri, carries a brick frieze which can still be seen at the corner of the Vicolo del Cuore. In this same city, upon the façades of old houses, notably the old buildings surrounding the church of San Michele, one finds, framed by courses of brick, old escutcheons of terra-cotta which "recall, in the midst of the ravages of the time, the clever touch of the old Pisan sculptors."[1]

At Lucca, in the Guinigui Palace, which dates from the thirteenth century, the columns of the entrance or vestibule are alone of stone; the rest is brick.

As in Pisa, Lucca, Pistoja, so in the old town of Siena are found buildings where terra-cotta, brick, and marble are combined skilfully, considered both as to effect and economy. We cannot insist too much upon the advantages of this kind of architecture, suitable for countries where stone is scarce, and which offers at the same time more gayety than brick alone. The Buonsignori palace, which is supposed to have been built at the end of the thirteenth century,[2] attracts attention, in Siena, by the use in its construction of brick and terra-cotta, mixed with stone. All the pointed arches have a peculiarity of construction which it would be well to describe here. The joints of the voussoirs do not converge, as ordinarily, to centres of the segments of the arch, but to the intersection of the axis of the opening with the base line of the arch. These bricks are 10.4 inches long by 2.36 inches thick, and have been ground to arch shape. The substructure of the building is brick of extreme hardness, laid with the greatest care; their red color and even surface are very well preserved. Beneath the first-story windows there is a decorative feature with arcade *motif* in terra-cotta, supported by consoles which alone are built into the wall, while the pieces of brick, of slight thickness, forming the arcade *motif* are simply plastered on, being held in position only by the consoles and the marble cornice placed above.[3]

In the same city the Palazzo Publico possesses an external façade wholly of brick with the exception of the ground story. The façades of the courtyard are also built of brick; the piers even of the lower story arcade are of this material.

At San Gemignano, one of the houses surrounding the piazza *de la Citerne*, and which seems to date from the fifteenth century, has a lower story of stone; the rest is red and white brick.

These Tuscan cities, in the province of Siena, were built upon a soil which lent itself marvellously to clayworking; therefore all, with the exception of Florence, which could easily procure stone of all dimensions, have their older portions almost wholly built of brick, with ornamental work in terra-cotta.

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[1] Lewis Gruner, Terra-Cotta, p. 29.

[1] Rohault de Fleury, La Toscane au Moyen Age. Paris, 1870.

[2] Verdier & Cattois, Architecture Civile et Domestique au Moyen Age et à la Renaissance. Paris, 1857. Vol. I., p. 27.

[3] Verdier & Cattois, Arch., etc., Vol. I., p. 51 and following.

We will not leave the peninsula of Italy, which furnishes us with so many valuable records for the study of this particular subject, without mentioning the brick buildings of Asti, very remarkable for their severity, their great simplicity, and the happy choice of methods in their construction and decoration. The cathedral, notably, is a peculiar example of the combination of brick and stone.

Let us pass to the countries neighboring to Italy. The southern provinces of France are localities still containing most interesting specimens of brick construction during the mediæval period; and among these examples we cannot mention a more beautiful one than the old convent of the Jacobins at Toulouse, a building which dates from the end of the thirteenth century. This monastery, transformed to-day into artillery barracks, comprises a double-naved church, a refectory, two cloisters, a chapter house, a sacristy, and a chapel, named from St. Antonin, now occupied as a stable. All these buildings are of brick, and built with the greatest care. The use of stone was confined to the tracery of the windows, destroyed for some years. The brick arcades of the great cloister are carried by columns of gray Pyrenees marble. The top of the church wall presents on the exterior a most monumental appearance, thanks to a feature which we find sometimes adopted in the religious buildings of this region; a gallery, built of brick, placed just beneath the cornice, allows of going around the building, and is lighted by circular openings on the exterior; on the interior side this gallery is pierced with small glazed windows through which the vaults can be examined. This "way of the rounds" is carried upon arches, also of brick, springing from buttress to buttress. But the tower which rises on the north side of the church is still the most original part of the building; it is there that we notice the new methods used by the architects of this period,—methods modified by reason of the very nature of the materials put into the work. This tower,[1] built upon an octagonal plan, is wholly brick, except the belt courses, gargoyles, capitals, and pinnacles, which are stone, and the columns in the upper balustrade, which are marble. Of the five stories into which the tower is divided, the last four are pierced with double windows having triangular-shaped tops. Fig. 2, which represents one of these windows, explains this peculiar arrangement, which the use of a single shape of brick in the whole construction gave rise to. Only the bricks in the arches of the upper balustrade are moulded to arch shape.[2]

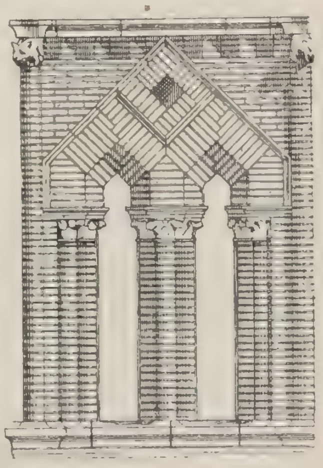

FIG. 2.

We will notice that the tower of the Jacobin convent is not crowned with a spire, while we find towers surmounted by octagonal pyramids of brick, at Toulouse even, at Caussade, and at Montauban.

Among the religious buildings of the Gothic period which Toulouse contains is the church of the Cordeliers, wholly built of brick, and the church of Taur, which has a brick gable, pierced near the top by a double row of windows arranged like those of the tower of the Jacobins.

The capital of the department of the Tarn, Alby, possesses, like Toulouse, very interesting buildings of the class we are considering. The church of Saint-Salvi, the building of which was commenced at the end of the twelfth, and continued during the thirteenth century, has its nave all brick, and a tower the top of which, flanked by a battlemented tourelle, is of the same material.

The cathedral of this city, started by Bernard de Castanet in 1282,[1] consecrated in 1480 under the invocation of St. Cecilia, and only finished in 1512, is one of the most important pieces of brick construction existing. This building, recently restored by M. César Daly, presents in its *ensemble* a regular mass, dominated by a colossal tower. Excepting the window tracery, the balustrades, and the choir screen, which are stone, the whole construction is brick, measuring $13\frac{3}{4}$ x $10\frac{5}{8}$ x 2 inches.[2] This material, blackened by centuries, has resisted the effect of time, like the most durable stone.

"The general effect produced by the exterior view of the cathedral of Alby," says M. Hippolyte Crozes,[3] "resembles in no way most of the buildings of this period. The solidity and bareness of the masses which make up the structure, the gravity of the style, bearing imprint of heaviness, excite feelings neither of deep admiration nor of surprise, but only that degree of interest which severity of line and grandeur of proportions give rise to."

The walls, forty meters high, are smooth, and flanked at equal distances with buttresses semicircular in plan. These tourelles, so to speak, give to the building (Fig. 3) the aspect of a military work.[4] Prosper Mérimée, struck by the circular form of these buttresses, which he says are without example in France, has thought that the architect, distrusting his materials, wished to avoid sharp angles, which are the first to deteriorate. It seems, meanwhile, more natural to believe, according to a generally accepted tradition, that the original plan was to raise all the buttresses above the roof and make tourelles of them, as the architect charged with the restoration has understood.

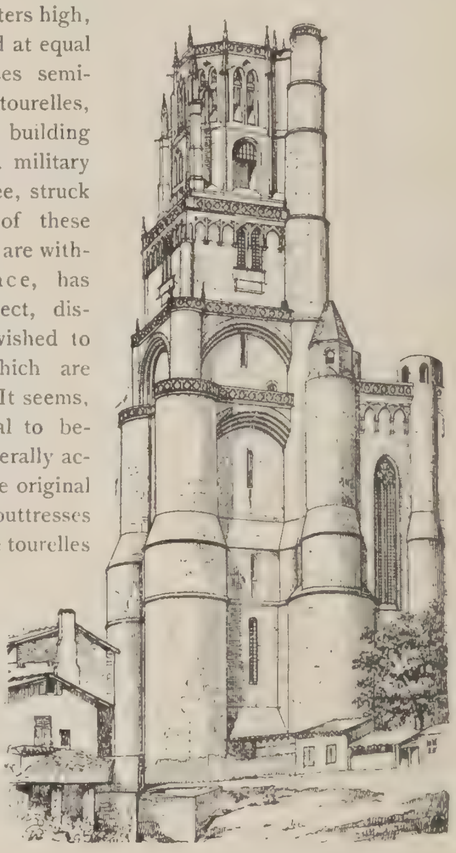

FIG. 3.

At the western end is the tower or donjon keep, flanked by tourelles, two hundred and fifty-eight feet high, quadrangular at its base, and gradually receding to give place to open-work galleries of stone. "It is," says Prosper Mérimée, "the highest pile of brick we know, with the exception of the South American pyramids."[5]

We see at Simorre, in the department of the Gers, another fortified church, of the sixteenth century, which is all brick, except certain door frames and window traceries. Some courses of stone also occur in the sloping tops of the buttresses. Fig. 4, made after a drawing by Viollet-le-Duc, shows the condition of this charming building before the restoration by M. Laisné. As in the religious edifices, brick construction was at that time used frequently for civil buildings and dwellings.

At the Capitole de Toulouse, which serves to-day as the city hall, the old donjon, now restored (Fig. 5), is built of brick, except the window frames and the foundation, which are stone.

In the same city, the college Saint-Raymond, a building of the fourteenth century, of which Fig. 6 is a perspective view, is of rectangular plan, with tourelles starting from corbels, at the angles. All the masonry, including, the machicolations and battlements which crown the face of the building and the gables, is brickwork; the lintels, mullions, and sills are stone. Numerous houses in Toulouse, Alby, Caussade, etc., bear witness in their construction of the use of terra-cotta. Viollet-le-Duc, in his "Dictionnaire Raisonné de l'Architecture Française,"[1] gives the elevation of a house in Caussade (Tarn-et-Garonne) in which the bases of the ground floor piers, the little columns in the windows, the belt courses, and the skew backs alone, are of hard stone; the rest is brick.

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[1] For a full view of this tower, see page 138 of Corroyer's Gothic Architecture, English Edition (Macmillan & Co.).

[2] Voillet-le-Duc, Dict. Raisonné de l'Architecture Française, Vol. III., p. 394.

[1] Girault de Sainte-Fargeau, Dict. Géographique de la France.

[2] C. Daly, Revue Générale d'Architecture, Vol. XV., p. 248.

[3] Notice sur l'Eglise Métropolitaine d'Alby. Toulouse, 1841.

[4] The cathedral of Alby is not, however, the only southern church which could, if need be, serve as a fortress; the same was true of the cathedrals of Narbonne and Béziers. See Viollet-le-Duc, Dict. Raisonné d'Architecture, Vol. I., p. 380.

[5] Notes d'un Voyage dans le Midi de la France. See also Hippolyte Crozes, Monograph de la Cathedral d'Alby, Third Edition, Vol. I. Toulouse, 1861.

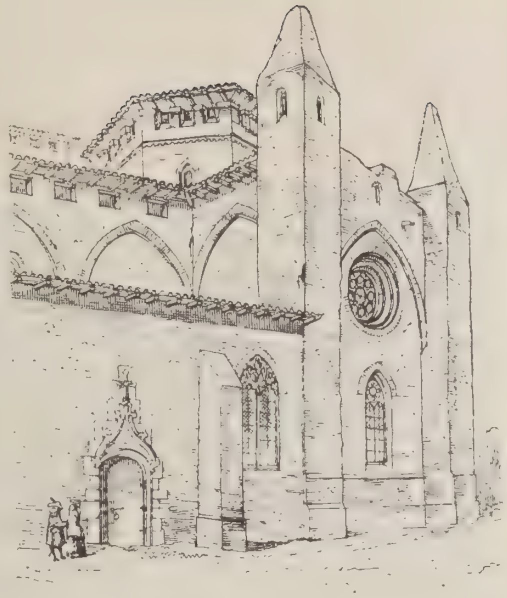
FIG. 4.

Some words remain to be said upon the dimensions in which this last material was used. The bricks in use in the south of France were ordinarily 13 x 9⅞ x 2⅜ inches, and the mortar joints were often from 1½ to 2 inches thick; but these proportions were sometimes far exceeded: thus, the brick used in the construction of the bridge of Montauban, built in the fourteenth century, are 15¾ x 11 x 2 inches. As to the use of ornamental terra-cotta, very widely spread as we have seen, in Italy, it is reduced in the localities we have just gone through to little modillions placed sometimes in the cornices, and to simple mouldings such as the cavet or quarter round. To obtain decorative effects, constructors preferred cutting brick, placing them diagonally, their corners projecting, or by alternate courses, on end, edgewise, or flat.

In the central and northern parts of France the dominating building material was stone. Brick was used only as a filling for half timber work, a use frequent during the fifteenth and sixteenth centuries; placed in different ways, they formed a variety of designs, which contributed to the ornamental effect. We will mention the houses of Verneuil (Department of Eure), which Verdier and Cattois have restored.[2] One of these houses, built in the fifteenth century, shows, upon almost the whole of its façade, a checker pattern of white stone, brick, and black flint alternating symmetrically. The other house, which dates from the century following, also shows a checker pattern of stone and of bricks placed in every fashion (Fig. 7).

At Lisieux we again find some houses of the sixteenth century, of half timber work, and a filling of brick, set perhaps flat, perhaps on end. In the city of Tours there is a very curious house, of brick and stone, dating from the fifteenth century, and known under the erroneous name of *maison de Tristan*.[3] All the walls are of red brick; stone is used for the lower story, and the framing of the openings, except in the arch of the door and the windows of a tourelle which flanks the building; the stairway enclosed in this tourelle, of which we give a perspective view (Fig. 8), is of the greatest interest: the newel, 16¾ inches in diameter, and the sloping vault, are brick like the walls forming the stair well; the stairs, both treads and risers, are brick.

The hand rail, built into the courses of the wall, is alone cut stone. The bricks used are 9 x 4½ x 21⅝ inches. We see that the builders of mediæval times knew how to overcome the greatest difficulties in masonry, with materials that seemed unfit for work of this kind.

Here, then, brick is used for the construction of ramped vaults; we will find it applied to the filling in of floors in a house about the end of the fifteenth century at Chartres. In this house, cited by Viollet-le-Duc[1] there exists a ceiling furnished with beams set with surfaces at an angle with the horizontal, and built into the walls, the spaces between them being filled by brick arches. This particular use of brick or terra-cotta, which many believe modern, is not, then, anything new.

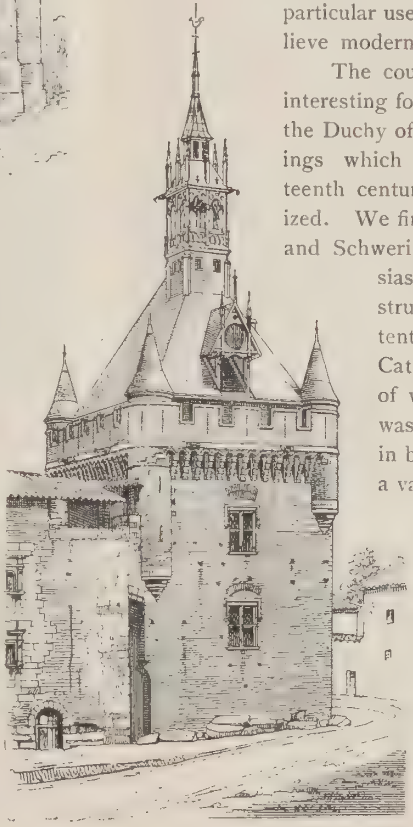
FIG. 5.

The countries neighboring to France are no less interesting for their brick architecture. In Germany, the Duchy of Brandenburg contains remarkable buildings which were built from the twelfth to the sixteenth centuries, and in which this material is utilized. We find also, at Marienburg, Lübeck, Dantzig, and Schwerin, curious buildings, secular and ecclesiastic, constructed of brick. Among the structures of this kind deserving the most attention we can mention the church of Saint Catherine at Brandenburg, the richest part of which, the chapel of the Holy Sepulchre, was built at the end of the fourteenth century, in brick of different colors, ornamented with a variety of designs.

Belgium and Holland furnish us valuable examples. Such are the public and private building which the city of Bruges, especially, contains. The belfry, a tower three hundred feet high, which rises above the market and dates from the end of the thirteenth century, is one of the most remarkable examples of brick construction we can cite. Its galleries, beautiful windows, pinnacles, projecting tourelles, the octagonal form of its last story, its upper balustrade, all give to it an appearance of unusual richness. Fig. 9 represents this fine belfry, which can be compared with those of Brussels, Ypres,

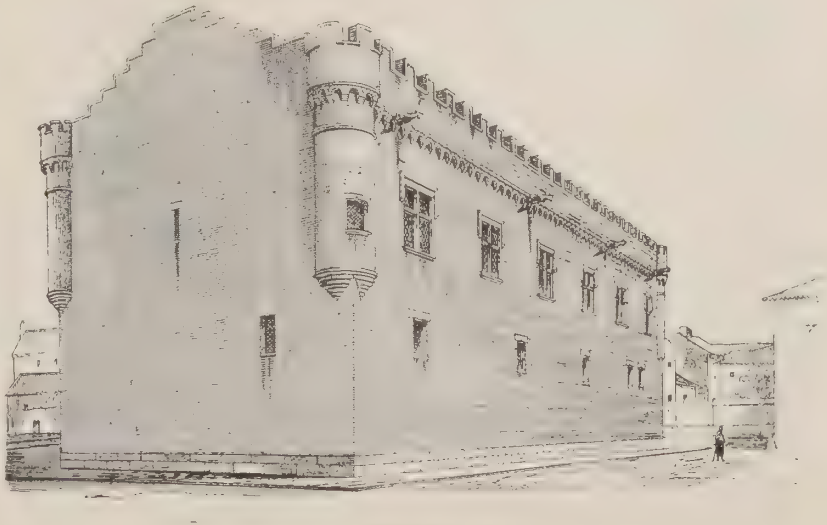
FIG. 6.

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[1] Vol. VI., p. 235.

[2] Architecture Civile et Domestique, Vol. II., p. 116 and 123.

[3] See Mame, La Touraine, p. 93.

[1] Dict. Raisonné de l'Architecture Française, Vol. VII., p. 205.

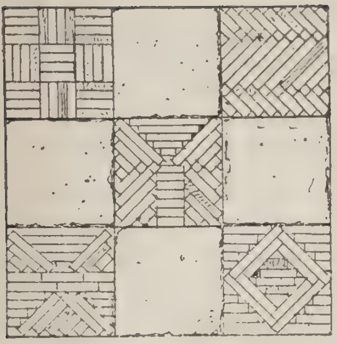


FIG. 7.

Ghent, Niewpoort, and Alost. A very curious use of brick also occurs in the lateral façade of the Bruges city hall.

We can also mention as interesting pieces of brickwork, in this same city, the south gable of the transept of the cathedral, constructed at the beginning of the fifteenth century; the eastern façade of the *hôtel de Grunthuuse*, of almost the same period; the consular residence of the Eastern nations, built by Jean van de Poele in 1478,[1] and a great number of private houses, built during the sixteenth century.

At Anvers we must particularly describe the *Halle à la viande*, a large, solid structure, dating from 1501, which can be considered in every respect one of the most remarkable types of mediæval civil architecture;[2] one notices, first of all, the masonry, — of brick, alternating with bands of cut stone.

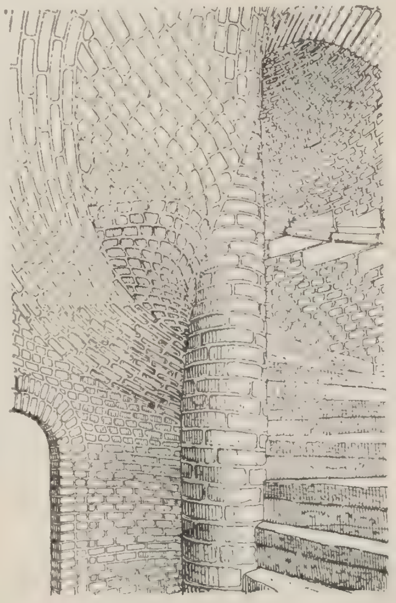


FIG. 8.

In England, a country whose soil contains admirable and abundantly distributed brick clays, the history of architecture shows a considerable break in the use of brick and terra-cotta. The Romans used them up to the fifth century. According to some writers, the Flemmings re-established in England the use of these materials;[3] it is true that at this epoch a great many factories for woollen stuffs were established by the people of this nation, in the country across the channel; but there is no positive evidence to this effect. It is enough to know that brick construction did not come into general use until towards the reigns of Henry VI. and Edward IV., that is to say, in the fifteenth century; from this period important buildings were built of brick, particularly in the eastern counties, and in all parts of England where stone is not common. Little Wenham Hall, built in 1260 or 1280 in Suffolk County, passes for the oldest English building built of modern brick. Caistor castle, near Lincoln, is still a beautiful example of brick construction of the Middle Ages.

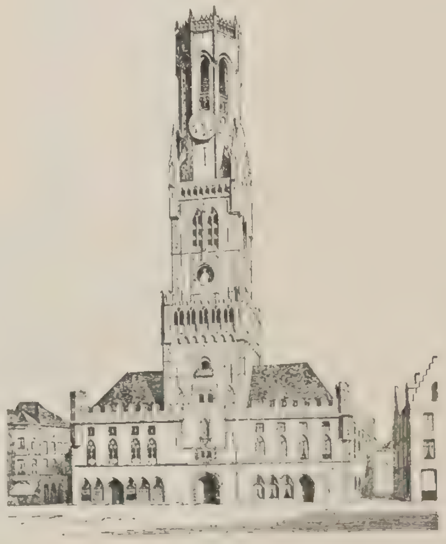


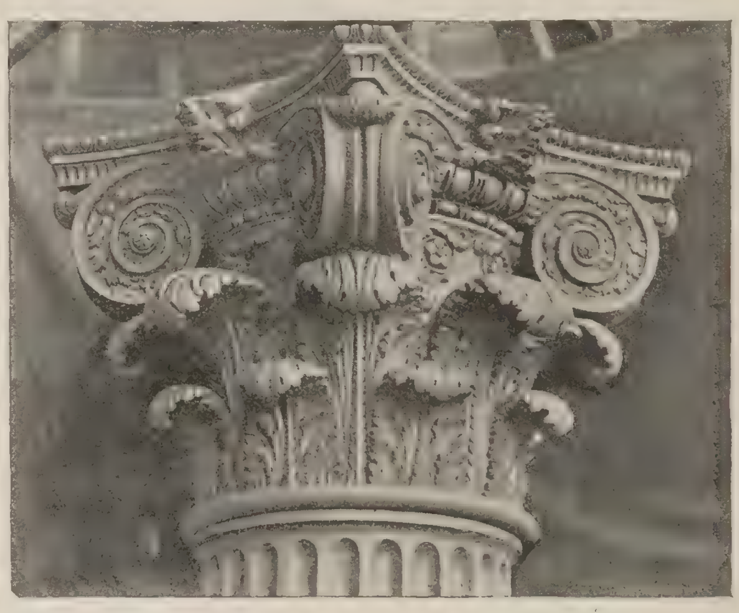
FIG. 9.

THE first of a series of "letters" upon recent brick and terra-cotta work in New York City will also be begun in the April issue. Everywhere in that city one sees brick and terra-cotta used on new work, and it is chiefly in the light shades.

PHILADELPHIA work will be taken up in the same issue, and after next month each city of importance will have a letter at least once every four months.

NOTES.

THE capital illustrated below was crowded out of last month's issue, as were the details on pages 41 and 42. These details, with the several plates of scale drawings published last month, give a very good idea of the terra-cotta work.



TERRA-COTTA CAPITAL FROM THE VOLTA BUREAU, WASHINGTON, D. C. MESSRS. PEABODY & STEARNS, ARCHITECTS.
MADE BY THE PERTH AMBOY TERRA-COTTA CO., PERTH AMBOY, N. J.

WE regret that we are again forced to announce the postponement of the first part of our translation of Choisy's "L'Art de Bâtir." The plates, which in the original are steel, require greater care and more time in their execution than was anticipated. We can, however, safely promise our readers that the publication of this work will be begun in next month's issue.

THOSE readers who have been looking for some mention of bricks in our reprint of "Brick and Marble Architecture in the Middle Ages," must remember this is the narrative of a journey. With the next chapter the rich brickwork of Lombardy begins to appear, and then the illustrations will be greatly increased.

THE April issue will also contain a fully illustrated letter from Providence, giving, among other things, several views of the new Congregational Church, by Carrère & Hastings.

THE part of THE BRICKBUILDER following the editorial page will be devoted to departments, the number of which, from issue to issue, will be increased. These will be of a semi-trade or business character, and in them will be found special items belonging distinctly to the trade or business which the department covers. This means that ultimately THE BRICKBUILDER will be a combination of a professional magazine and several trade publications all under one cover, for as each department develops with its particular line of advertisements it will become in itself the equivalent of a separate periodical.

OUR subsequent issues will contain valuable matter on paving brick. We would call attention to this as being of special interest to the manufacturers.

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[1] Verschelde, Les Anciennes Maisons de Bruges. Bruges, 1878. Vol. I., p. 11.

[2] Lonnig, Album Historique de la Ville d'Anvers, avec Notices Historiques, par H. Mertens (p. 51). Anvers, 1868.

[3] See C. Daly, Revue Gènérale d'Architecture, Vol. I., p. 159.

BRICK AND MARBLE IN THE MIDDLE AGES.

CHAPTER III.

> "Where the mountains
> Lift, through perpetual snows, their lofty and luminous summits." — *Evangeline.*

WALLENSTADT, SARGANS, GORGE OF THE TAMINA — RAGATZ — CHUR — EMS — REICHENAU — THUSIS — ZILLIS—ANDEER—SPLUGEN — THE SPLUGEN PASS — THE CUSTOM HOUSE — CASCADE OF THE MEDESSIMO — CAMPO DOLCINO.

THE storm of the evening gave no kind augury of sunshine on the morrow, and with rather anxious thoughts we listened as it roared among the mountains which overhung our hostelry. But it seemed that we had suffered enough, and when we woke we found that, though the clouds had not yet cleared off the sides of the mountains, there was nevertheless every prospect of a fine day.

We were obliged to leave by an inexorably early steamer, at half past five, for Wallenstadt, and so lost all but the suggestion only of the magnificence of the mountains which tower up so grandly over the north shore of the lake. Like Goethe, on his way into Italy, we might exclaim: "What do we not pass over, both on the right hand and on the left, in order to carry out the one thought which has become almost too old for the soul!" But our time was limited, and our chief anxiety to spend as much of our short holiday as we could in Italy; and so, sad though we were to miss what was doubtless so well worthy of being seen, on we were bound to go without delay.

Before we started I had secured a voiturier, whose carriage was at Wallenstadt, to take us on to Chur, so that on this score I had no trouble before me. Our voyage was only too soon made. Unlike the Lake of Zurich, where the traveller rather hopes that each place at which he stops may be the last, on this lake, as the tiny steamer ploughs its way rapidly over its surface with its goal always in view, and with not a place to stop at on its road, he ceases not to long that his pleasure may be prolonged. By seven o'clock we were in our carriage and *en route*. The sun began to shine, and every minute the clouds rose higher and higher, so that, before we finally lost — by turning into the valley of the Rhine — the last view of the valley of the lake, we could see the peaks of the mountains which we so wished to have seen before, the Sieben-Churfürsten, which tower so grandly over the lake.

Wallenstadt is but a poor place, its situation being unwholesome, and its inns not much to be commended. It has a church of modern character, with an old-looking tower in the position of a transept, with a saddle-back roof, gabled north and south. On the lower part of the south side of this tower are paintings of the Crucifixion and some other subjects, apparently of some antiquity. Just above the town, on the right, we passed the ruins of an old castle; and at a slight rise in the road had a beautiful view of the calm waters of the lake, looking blue, but very much smaller than it really is. This, no doubt, is owing to the great height of the precipitous rocks on its north side, which we now saw for the first time, the clouds having at last risen and disclosed some of the beauties which they had been concealing from us.

The valley, from Wallenstadt to Sargans, just beyond which our route, after crossing the very low watershed, joined the valley of the Rhine, was strikingly beautiful. Its ecclesiological features were not, however, remarkable, if I except the constant repetition of what I have often noticed in the Catholic cantons of Switzerland, and in Tyrol,— the occurrence, namely, of grated openings on either side of the western doorway, commanding the interior and protected by an open porch, through which passers-by, though not able to enter, might still see the altar. On our journey from Basel to Zurich we passed a church, the altar of which was lighted up, and the doors behind these gratings left open very late at night. It was in a lonely place, and when I passed there was no one in or near the church. I never see this arrangement without wishing to introduce it in England. There are so many of our churches which cannot conveniently be left always open, and where such a provision might suggest to passers-by, as it does here, the propriety of using a church at other times than those of public service.

The cultivation of this valley is not so uninteresting as its ecclesiology. Here we first found the vines trained about in the horizontal Italian fashion, whilst under them great gourds and pumpkins developed themselves to a prodigious size.

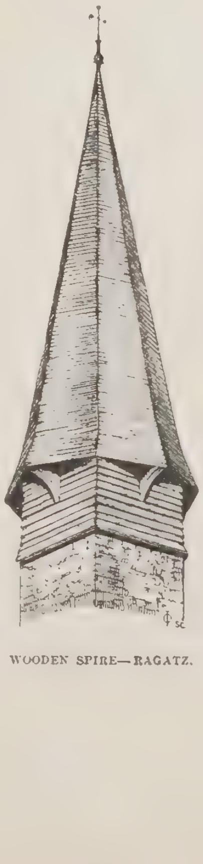
Sargans is a very picturesque old town, and has some capital examples of old Swiss carpentry in its houses; in addition to which there is a picturesque and antique-looking castle, rising high above the houses on a rock, guarding the eastern entrance to the town, and commanding the junction of our road with that of the valley of the Rhine leading to the Lake of Constance.

Our coachman was under a bond to travel as fast as a diligence which lumbered on slowly in advance of us, and as far as Ragatz was quite true to his word; there, however, we determined to pause for a few hours, not willing to pass anything so famous as the baths of Pfeffers without a visit. Leaving our carriage, we mounted a light car, and were soon ascending the beautiful gorge of the Tamina to the baths. The road is capitally made, and follows the windings of the mountain torrent so closely as to require some nerve in those who drive rapidly along on their road to or from the baths. The ascent is steep, but in rather less than an hour we found ourselves at the baths. The rocks rise nearly perpendicularly behind the ledge of rock on which they stand, and the only mode of access to the upper and more wonderful part of the chasm was by passing through the long corridors, which betokened the once religious object of the building. These passed and in charge of a guide, we crossed the torrent by a rude bridge, and then by a rather precarious path made our way, as it seemed, almost into the bowels of the mountain. The gorge is so very narrow that in many parts the light of the sky is no longer visible, the rocks overhanging each other above the head. All the while the torrent is roaring by our sides, and we feel that we are indeed enjoying an excursion into the very heart of the rocky earth. At last we reach the end of the path, are compelled by our guide to ensconce ourselves, one by one, in a small kind of box formed round the source of the spring, — to pronounce it very hot and very nasty (its two most eminent qualities) — and then, still admiring the matchless grandeur of the rocky way, were gain our car and are soon again whirled down the hill to Ragatz.

Our driver is a cheerful, pleasant fellow, talks German much better than the man we brought from Wesen, is communicative, moreover, and seems to enjoy a laugh and a joke uncommonly. Of course we become friends, and with no trouble on our parts, though with some little on his, it is arranged that our old driver shall remain where he is, and that our new friend, proud in the possession of the then very necessary Austrian passport, shall take us on as far at any rate as Chiavenna. A hurried Swiss luncheon — wine, honey, bread and butter — is soon dispatched, and again we are on our way, under the auspices of our new voiturier.

But we must not leave Ragatz without noticing its church, remarkable for its exceedingly good octagonal wooden spire springing in an unusual manner out of a square wooden belfry stage, and another church at (I think) Vilters, close to Ragatz, which has a lofty tower finished on each side with a sharp gable, and a thin octagonal spire rising from the intersection of the cross gabled roof; both these steeples are in a position which for some reason is very popular in this district, — the south side of the chancel.

From Ragatz to Chur the churches are all very similar; they have tall towers generally in the same position as those near

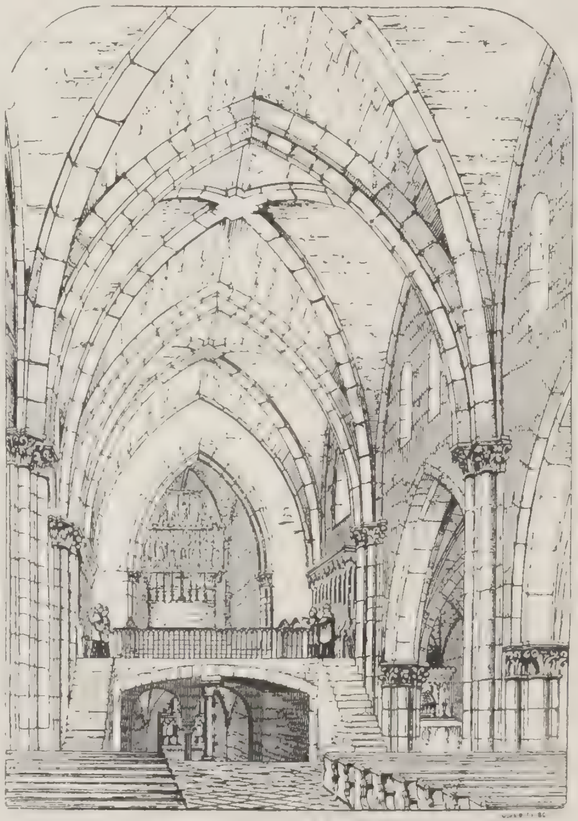


WOODEN SPIRE—RAGATZ.

Ragatz, and capped with bulbous roofs, or sharp spires covered with metal. The road is not quite the most agreeable we have travelled; some of the views, it is true, are most lovely, and the mountains — among which towers pre-eminent the grand outline of the Falkniss — are very noble; but, despite all this, the valley is too wide, and the Rhine, by periodical inundations, manages to secure so nearly its whole extent to itself that there is a waste, desolate, and pestilential look in the foreground which is not prepossessing. We arrived at Chur at about half past one, and, not sorry that our horses required rest, betook ourselves to the inspection of this very curious town.

It is entered by old gateways, and many of the streets are still full of ancient houses. The curious feature of the place is, however, its complete division into two quarters — the Protestant and Catholic — the latter walled off and entered by its own gates.[1] It occupies the upper part of the town, and contains in the cathedral church of S. Lucius an attraction for architects which has unusual merit and interest. Its plan consists of a nave of three bays, a choir of one bay raised by twelve steps above the nave, and a sanctuary much narrower than the nave and choir, and also of one bay. The steps from the nave to the choir are narrow and on each side, and between them is a very flat, wide arch, under which access is obtained to the crypt, the floor of which is a few steps below the nave, and extends under the choir and sanctuary. The plan is, it will be seen, not unlike that of the cathedral at Zurich, save that here there are no apsidal terminations at all.

A sketch of the interior of so singular a church cannot be uninteresting, and it will be seen from this that the whole is of the very earliest pointed work, and good of its kind; the crypt is supported in the centre by a column resting upon a grotesque animal. Two of the altars have fine shrines of metal of the thirteenth century, and two other altars have ancient pricket candlesticks, and there are some fine brass standard candlesticks, also; the choir stalls are old, and there is a late triptych behind the high altar, and a very fine Sakramenthaus with metal doors just below the northern flight of steps to the choir, which reminded me of the very fine example in a similar position in the cathedral at Ulm. The altar is of stone of the thirteenth century, with five detached shafts in front, supporting the slab or Mensa. The whole church is groined. It is worthy of notice that the choir makes a great bend out of the straight line, towards the north, — so much, indeed, that it is impossible to avoid noticing it as one enters the church. The steps from the nave to the choir lack dignity. But it is true that if they had been in the centre, and the entrances to the crypt on each side, the crypt would not have been seen, as it now is, from the nave, and a striking effect would have been lost. The west end has a fine, round-arched doorway with several shafts in each jamb, above this, a large window of the same character, and in the gable a small middle-pointed window. About ten feet in advance of the west doorway is a curious remnant of a gateway, with piers and shafts resting upon monsters, looking, however, very much as though it had been removed from elsewhere.



3.—CATHEDRAL, CHUR.

Service commenced just as I was obliged to think of leaving the church; the priests wore red cassocks, and tippets, and very short surplices edged with lace, and looked unclean and untidy; there was no one in the body of the church, and the sacristan, after the service had commenced, walked backwards and forwards about the choir, down the steps into the nave, and then — after a little attention bestowed on some matter there — out of the church. On a subsequent visit to this church (in 1872) I found repairs in progress, which bade fair to destroy some of its great archæological interest.

Descending from the melancholy and squalid-looking Catholic quarter, we soon came upon the Protestant church, dedicated in honor of St. Martin, which is now somewhat remarkable. It is old, but it has been plastered, whitewashed, and then painted by some original artist over its whole exterior, in an extraordinary imitation of all kinds of inconsistent architectural devices; pilasters, cornices, mouldings, tracery, and the like, are all boldly represented with black paint, and in such style that we all stopped the moment we saw it, struck by the conviction that it must be a scene from some play, so utterly absurd, flat, and out of all perspective did the whole look.

The situation of Chur is very lovely, placed as it is just at the point where the Schalfiker Thal joins the valley of the Rhine, and upon the steep and rugged bottom slope of the mountains.

The weather was every moment becoming more glorious, and just as we left Chur, along the road which leads to Reichenau, we had one of the most lovely views we had enjoyed. It is not always the case, however beautiful may be the scenery, or however lovely the weather, that one finds everything grouped together perfectly; here, however, it did, and I commend the subject to the pencils of those who follow me on this route.

We soon reached Ems, whose church, situated upon a green knoll above the village, has the peculiarity of a small apsidal building east of the chancel apse. The key was not to be found, so that I could not go in and examine what this building was. This church had an octangular steeple, whilst another church in the same village had one of the bulbous coverings of which I have before complained. At Reichenau it is proper to go to see the house in which Louis Philippe acted in 1793 as schoolmaster under a Monsieur Jost, and I fear we fell rather in the good opinion of our driver when we neglected so proper and regular a custom; but so it was. The garden of the inn is charming, and from its edge you obtain the best view of the junction of the Vorder and Hinter Rhine, and having enjoyed this thoroughly we passed rapidly through Reichenau, across to its two quaint covered wooden bridges, and by the beautiful meeting of the waters, until we found ourselves following the course of the Hinter Rhine and fairly on the Splügen road.

We only wished to reach Thusis by sunset, and so our time was ample for enjoyment; we walked much of the way, detecting eagerly every here and there patches of snow on the mountains in the distance, each of which is hailed as a discovery by every fresh traveller, who feels himself transported with delight by the distant view of the pure white against the sky.

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[1] This division is seen clearly in one of the curious prints by Merian, which illustrate a most valuable and interesting book, entitled, "Topographia Helvetiæ," published at Frankfort-on-the-Main, A. D. 1654, and full of the most picturesque and exact pictures of Swiss towns. They are valuable as proving beyond all question their state in the beginning of the seventeenth century, and as being executed with very much artistic feeling. That of Chur gives the whole town in the most complete manner; the castle, the churches, the walls and the many watch-towers, with the magnificent mountains behind them, making one of the most picturesque *ensembles* conceivable. Many of these views of Swiss towns are remarkable, as proving how very regularly the mediæval towns were planned whenever there was the opportunity — the streets all at right angles, and the great church and market place in the centre of the whole.

Castles are here as numerous as ever upon the Rhine, and at least a dozen, I should think, might be reckoned perched on every favorable spot between Reichenau and Thusis. As the road advances the valley widens out into a kind of basin, into which flow two streams, the one through the as yet unperceived gorge of the Via Mala rather to the right, the other through an opening in the mountains directly in front of us, which allows us a charming view of the snowy heights above the Julier Pass, drinking in the last red rays of the setting sun, long since passed away from the ground on which we stand; then there is a long ascent, and, passing peasants coming in from hay-making, merrily laughing and singing, we drive up the straight, ugly street of Thusis to the Via Mala Hotel. But the evening is too glorious to lose, and in five minutes we are out again on foot to explore the commencement of the black defile; and until we are absolutely turning into it, so narrow is the gorge that it is not seen, but when seen, and by such a light, how grand and beautiful it is! We ascended some distance and then stood and admired. Above us tremendous rocks towered high into the air, riven in two for the narrow chasm in which we stood, at whose bottom we heard the distant roar of the Rhine, and down below and beyond, framed as it were between the grand outline of rocky crag and pine-covered mountain, lay the valley of Domleschg, still retaining, by contrast with the gloom around us, some light upon its fields, and castles, and villages. Rest was well earned after such a pleasant and actively spent day, and, if we were late in starting in the morning, it was as much the fault of our coachman as of ourselves. However, though not so early as we intended, we left soon after six, and in a few minutes were again in the Via Mala. And now by daylight I doubt whether we were not all disappointed; there is so much in a name that one expects something *very* terrific from such a name, and this it scarcely is. It is seldom fair to compare one piece of scenery with another, but still I feel that this certainly was not the most savage I had ever seen, and therefore not justly *my* Via Mala. But beautiful in the extreme it was, and I believe we all regretted that we so soon found ourselves again in the more open valley on the road to Zillis. Here we found a church with a lofty tower, in the same position, and with a spire of the same design, as that at Ragatz; the nave low and ugly, the chancel lofty, with a steep pitched roof and apse; the windows pointed but modernized; the belfry windows of the steeple of three lights, with circular arches, and divided by shafts, which were continued on in blank panels on each side of the windows, so as to form an arcade of five arches on each side. And this I believe was the last noticeable church we saw before we reached Chiavenna, and in its arcaded belfry I fancied that I saw something of an Italian influence at work, which might well have been the fact.

We soon reached Andeer, where we waited but a short time, and then commenced a steep ascent. The lovely scenery, the mountains closing in round us, and the roar of the falls of the Rofla making music in our ears, made our way very enjoyable. There was but little chance, however, of rapid progress, as from Andeer to Splügen the road is almost always on the ascent, sometimes gradually, at others in steep zigzags up the shoulder of some obstructive hill, and constantly overhanging or crossing the rapid, white, foaming mountain stream, sole representative here of the noble river whose broad waters have been admired at Basel. The air of desolation becomes more decided as one reaches Splügen. Trees and shrubs more scarce, and often blasted by the fierce rush of the wintry wind, or the keen, sharp blow of the fallen rock, or the swift sweep of the avalanche, aid in making up the desolate picture. Vegetation has well-nigh ceased, and the eye, though deceived at first by the intensely red color perceived every here and there on the hillsides and on the rocks, discovers presently that not to flowers or plants, but to lichen or other such desolate vegetation, is it owing.

By the time we caught the first sight of Splügen the sky was overclouded, the wind rose, and a sudden heavy storm of rain gave us a lesson in the customs of the weather in these regions, to which our driver's quiet assurance that we should probably have a snowstorm on the pass added the few remaining drops required to make up the draught which we saw ourselves doomed to swallow.

Splügen, however, was reputed to have an inn which would give us enviable shelter for a couple of hours, and we entered at once, hoping, if we waited, again to see the blue sky before we crossed the boundary between the north and south, — between Switzerland and Italy.

The *table-d'hôte* was just about to commence, and in came a diligence from Milan, and out came the passengers; another carriage, which had pursued us relentlessly all the way from Andeer, came in at the same moment, and down we sat, about fifteen English people, not one of whom had been in the house ten minutes before, not one of them stopping for more than their own and their horses' dinners, and all proceeding in different directions, either on their way home, satiated with travel, or just about to dive like ourselves, in full quest of pleasure and excitement, into a new country. These meetings are always curious, generally amusing, and to the quiet and attentive observer of character not a little edifying. On this occasion there was subject-matter enough, and we found an old gentleman, travelling sorely against his will under the care of an active and thoroughly vulgar wife, some literary old maids of another party, and the enthusiastic damsel of a third, each in their way amusing, and not the less so in that it was necessary to inspect them and part with them so rapidly.

Splügen, in a soaking rain, is not a pleasant place; and as I employed myself in sketching from the inn window the very picturesque old bridge, which gives[1] all its architectural character to the village, I conceive that I accomplished all that was necessary; and when we got into our carriage again, and, crossing by the bridge, left the Bernardin road to the right, and finally plunged really into the Splügen route, it seemed like a reward for my industry to find the rain cease and the sun again occasionally shine out.

The ascent begins with a series of zigzags, which rapidly carry the road high above the valley of the Rhine, and then, passing through one of the long covered galleries for which this route is famous, it emerges in an upland valley or dip between two mountains, up which it takes a steady course along a road macadamized, by-the-by, mainly with the white marble which abounds here, until, just below the summit, it comes again upon a steep mountain side, to be summounted only by a patient unravelling, as it were, of the intricacies of an endless zigzaging, which at last brings us to the Swiss guard-house and the entrance to the great gallery. The clouds are low and gathering; but still as we see below us white patches of snow every here and there, and above us the blue edge of a great glacier marked with lines of crevasses and fringed with a white edge of snow, we feel that we have really at last achieved the summit. Noisily we trot through the arched gallery, and then, after another slight ascent for a few minutes, we stop and put on the drag, and then down we go rapidly and cheerily, backwards and forwards, occasionally giving a merry tap to some corner post at the turns of the road, in order to let it be known that we, our driver, and our horses, are all of us heartily glad that we are at last on the south side of the pass — no longer the German Splüg*en*, but, as we learn from drivers' notices along the road, the Italian Spulg*a*. A short drive takes us to the custom-house, — not looked forward to cheerfully by those who have met, as we had at Splügen, a man turned back by mistake, and after two days' delay again retracing his steps, — but happily, in our case, passed easily enough, and with an exhibition of the greatest courtesy and civility from the Austrian officer, the mention of whom reminds me of the great change which has taken place in the political status of this country since first I made acquaintance with it. It is a change of no little importance to the traveller, who now goes without let or hindrance almost everywhere, instead of being worried out of his life by troubles about passports which even Austrian courtesy could not make tolerable.

We are soon off again across a drear and peaty-looking plain, with no view of the neighboring mountains, and accompanied along the road by a troop of wild smuggler-like fellows, in broad-brimmed, steeple-crowned hats, loose jackets, knee breeches, and coarse stockings, riding wildly along on rough horses, without saddles or bridles, but every one of them handsome, grand-looking fellows, showing, as they smiled, teeth of the purest white, and more nearly coming up to one's idea of real Italians than any with whom, later in our journey and more in Italy, we happened to meet. Before long, however, we again commenced the descent, and then, after passing through two or three galleries of prodigious length, at last came out upon one of those spots, the view from which, as much perhaps by reason of its associations as for its intrinsic beauty, rests on the mind forever after, as one of the most lovely ever seen. On our right a steep mountain track slopes rapidly and almost perpendicularly down to a narrow valley, whose opposite and no less precipitous side we are about to descend; below us, far down, we see the village roofs of Isola, with its church and Italian campanile; beyond, — and this is indeed the great charm of the prospect, — down the valley, where the atmosphere seems redolent of the South, we see a grandly formed mountain, and again to its right another, but more distant; between these two dim and distant shades lies the lake of Como, beyond them the broad, rich plain of Lombardy; the sun shines forth, and we dream henceforward of that valley looked down upon from the gallery on the Splügen, as one of the brighest prospects of our lives!

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[1] I grieve to say it does so no longer. When I last crossed the Splügen, in 1869, this bridge had disappeared, and one of iron had been erected in its place. It was a capital example of the skilful carpentry of the old Swiss bridge-builders.

We had not gone far beyond the last gallery before our voiturier made good a boast which he had often repeated, of showing us a real waterfall on a grand scale before we parted company, and, pulling up his horses, made us — not unwilling — dismount to look *down* the cascade of the Medessimo. A passage has been formed from the road to a point which just overhangs the fall, and here, securely parapeted round, you look down over a grand sheer fall of some eight hundred feet, in the course of which the torrent which goes to feed the thread-like Lira down below us in the valley, and just now roaring in bold volume underneath our road, loses itself in soft, delicate, and fairy-like spray, and ere it reaches the rock below seems like some delicate mist falling from the sky forever in endless and exquisite change of form. Just beyond the cascade the most wonderful part of the descent, in an engineering point of view, commences, and the road seems really to descend the perpendicular face of the rock, surpassing in boldness most other roads that I know, and affording very fine and varied views of the cascade on the descent. We soon reached Campo Dolcino, a miserable and most dirty-looking village, and were, sorely against our will, obliged to wait for our horses to bait; and then on we went, the sun some time set, and the night dark and cloudy. Presently a storm arose; and without lights, and travelling along a road turning sharp angles every minute, and never losing the music in our ears of the roaring Lira, our lot seemed more wild than enviable; at last we came to a house and tried unsuccessfully to borrow a light, but presently at another house we succeeded, and then guided by a lantern we pursued our way safely enough. I have seldom been out in so grand a storm; the lightning was vivid beyond all that I could conceive; and as at one minute it played about on the foaming water beneath us, and at another, lighted up the whole mountain side beyond with pale and intensely lovely light, flickering, playing, and dancing about in the wildest fashion, I believe we felt half sad when house after house appeared, and at last we entered the long, narrow, and thoroughly Italian streets of Chiavenna.

Another journey took me to Chiavenna at the same time in the evening, in my way north from Como. It was the night of the 8th of September, the Nativity of the Blessed Virgin, and every peasant in his solitary châlet on the mountain side was burning a bonfire in her honor. There seemed to me to be something very touching in this flaming burst of distant greeting from mountain to mountain, and few circumstances have ever brought home more vividly to me the isolation of these mountaineers, than the compensating power of a sympathetic faith which made them thus bid each other welcome by their flaring fires.

G. E. STREET.

(*To be continued.*)

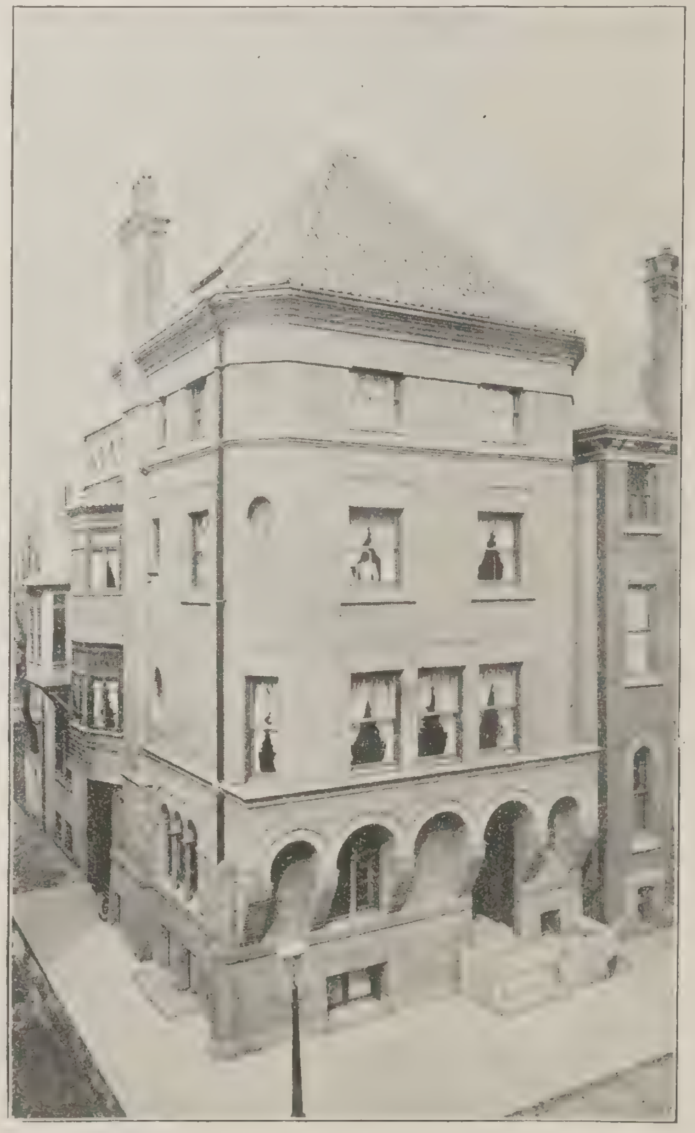
THE ILLUSTRATIONS.

Plates 17 and 24. *Drawings by Mr. G. Sicoli of Providence, R. I., of Italian brick windows;* from wash drawings by Prof. Strack. The Palazzo Rocca-Salimbeni at Siena seems to have been a fortified private palace, while the Palazzo dei Giureconsulti at Cremona was a public building, erected, according to the inscription on its façade, about 1292.

Plates 18 and 19. *New School Building at Greenwich, Conn.*, Messrs. Loring & Phipps, architects, Exchange Building, Boston. These sketches show two different views of this recently completed building. The treatment of the arcaded porch is particularly interesting, and we expect within a month or two to publish a large detail of this arcade.

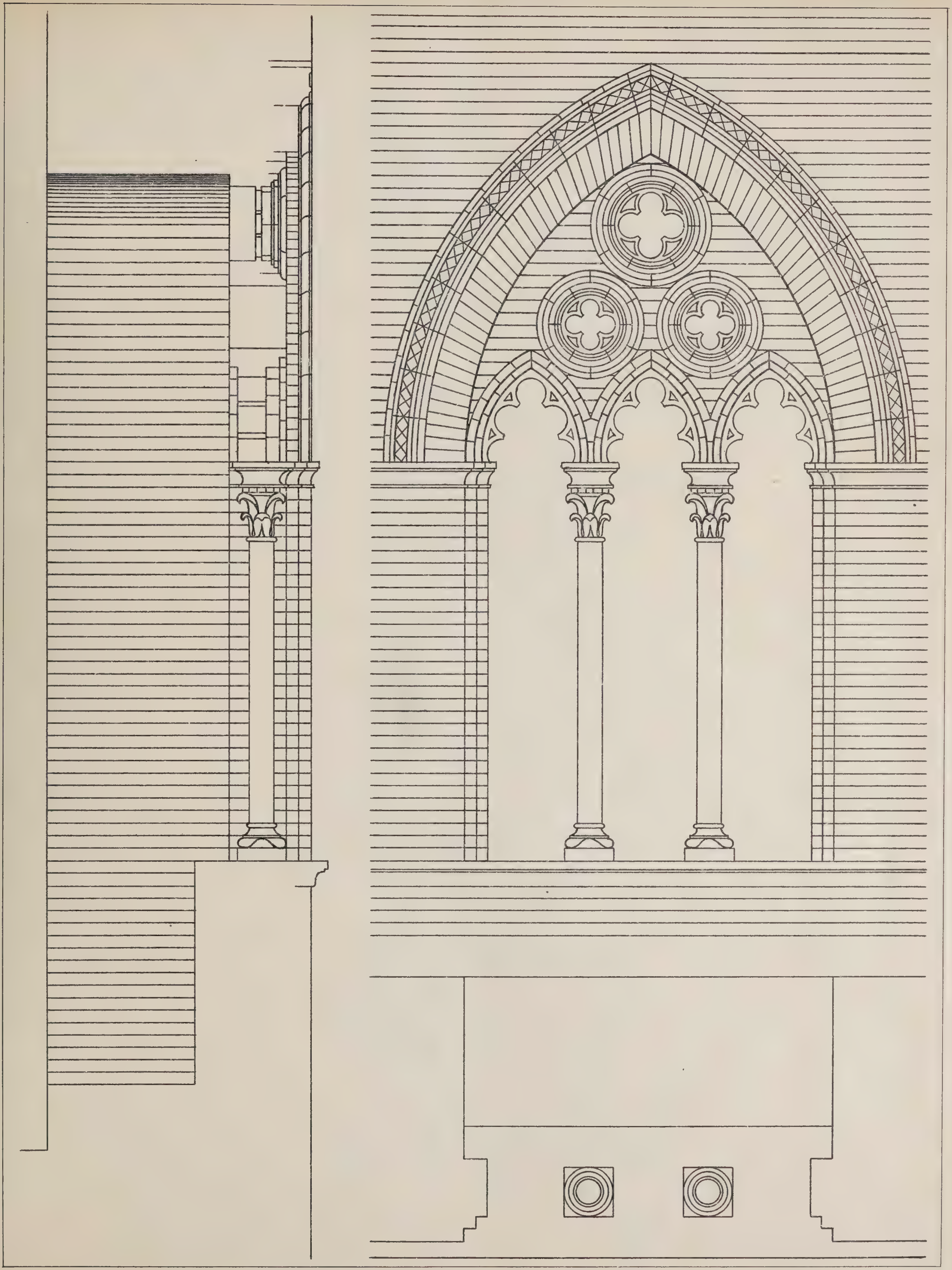
Plates 20 and 21. *A detail from the Museum of Art, Providence, R. I.*, Messrs. Martin & Hall, architects, Providence.

Plates 22 and 23. *Residence of Mr. H. A. Lewis, Philadelphia*, Mr. W. Whitney Lewis, architect, 85 Water Street, Boston.

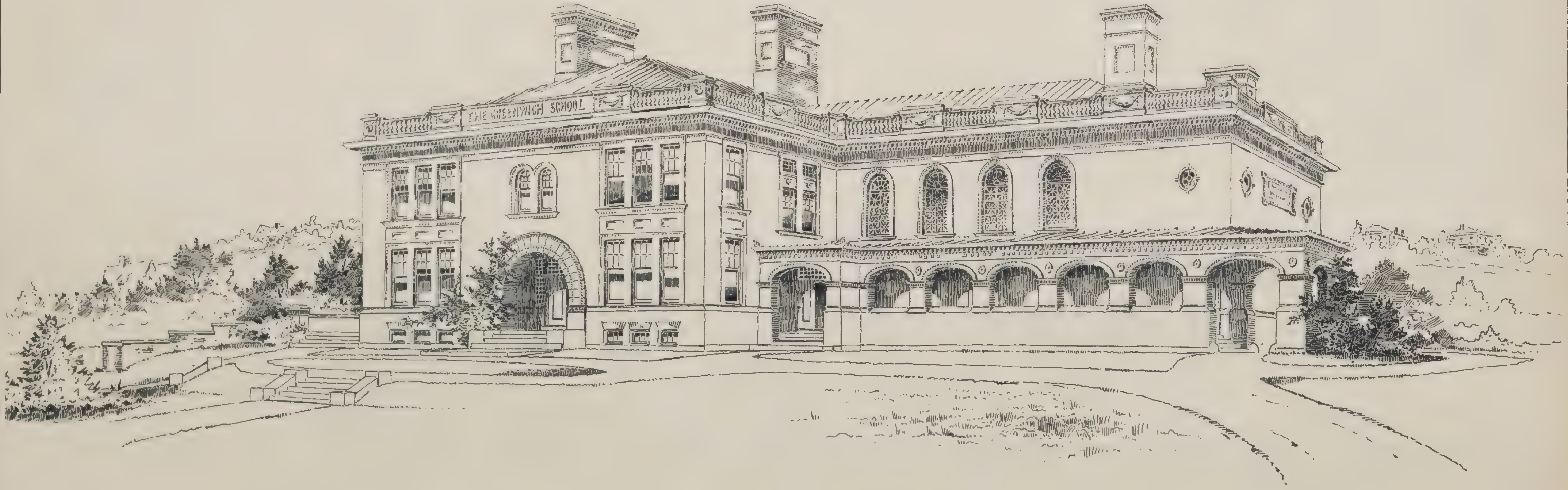


RESIDENCE OF MR. H. A. LEWIS, PHILADELPHIA.

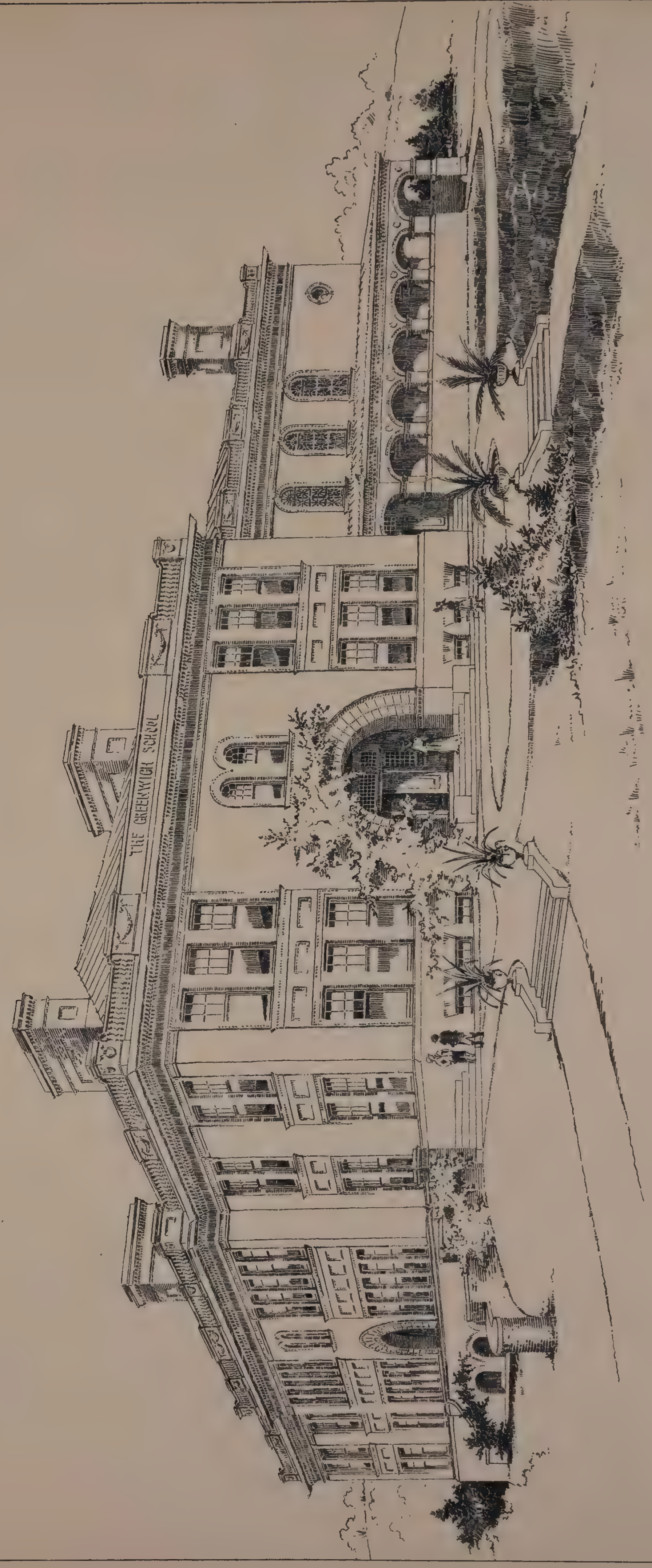
This residence, of which a photograph is shown above, is a very clever handling of an exceedingly small lot of ground. The photograph gives one the impression of a much larger house. The heavy corbelling of the lower story secures additional room in the upper stories, but it is not the sort of work that an architect, weak in constructive genius, should attempt. The terra-cotta detail is very interesting, and is the work, of course, of Mr. Lewis's own company, — the Perth Amboy Terra-Cotta Co.



WINDOW IN PALAZZO ROCCA-SALIMBENI, SIENA.



NEW SCHOOL BUILDING, GREENWICH, CONN. VIEW FROM THE NORTH-EAST.



NEW SCHOOL BUILDING, GREENWICH, CONN. VIEW FROM THE SOUTH-EAST.

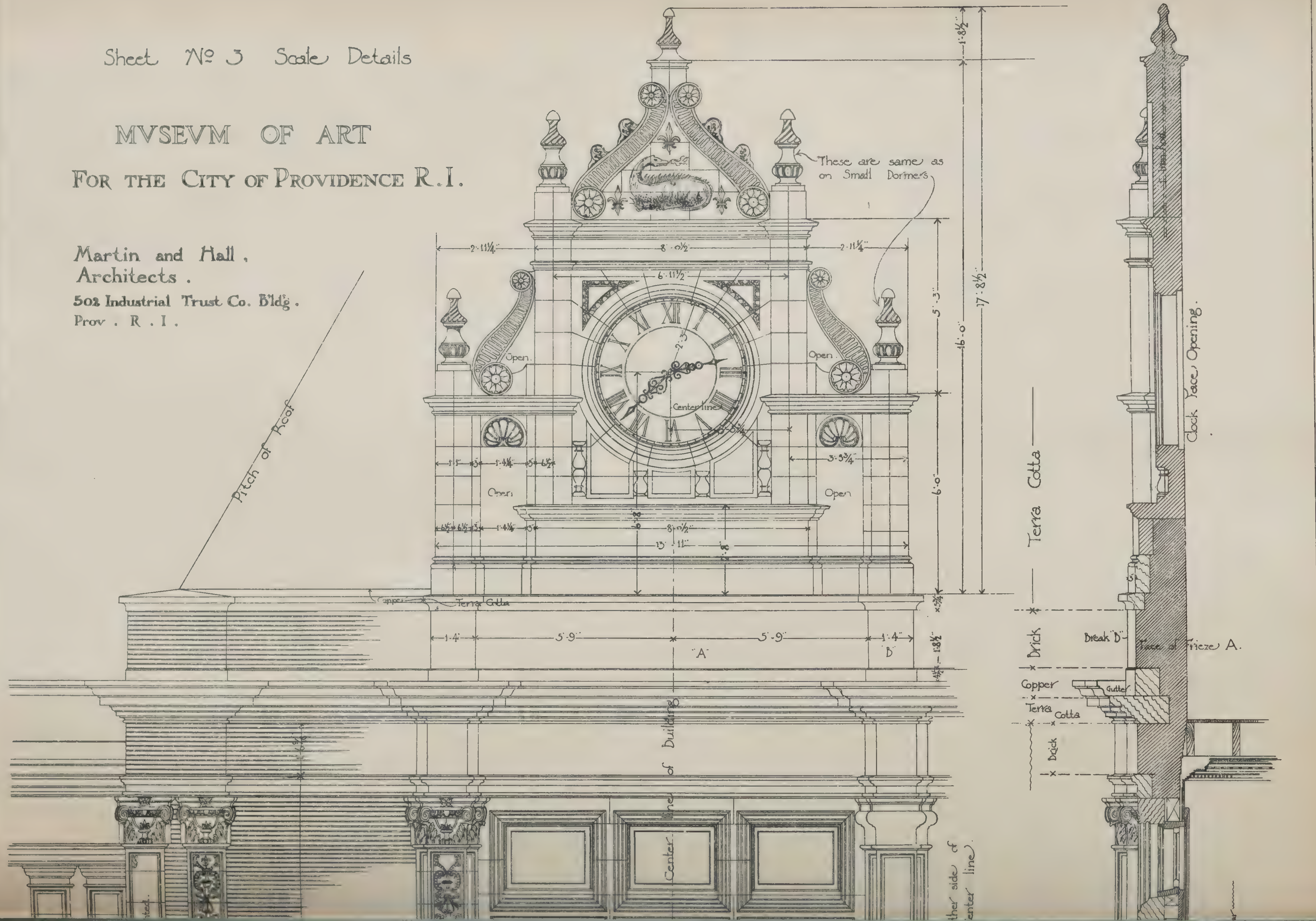
LORING & PHIPPS, ARCHITECTS, 1108 EXCHANGE BUILDING, BOSTON.

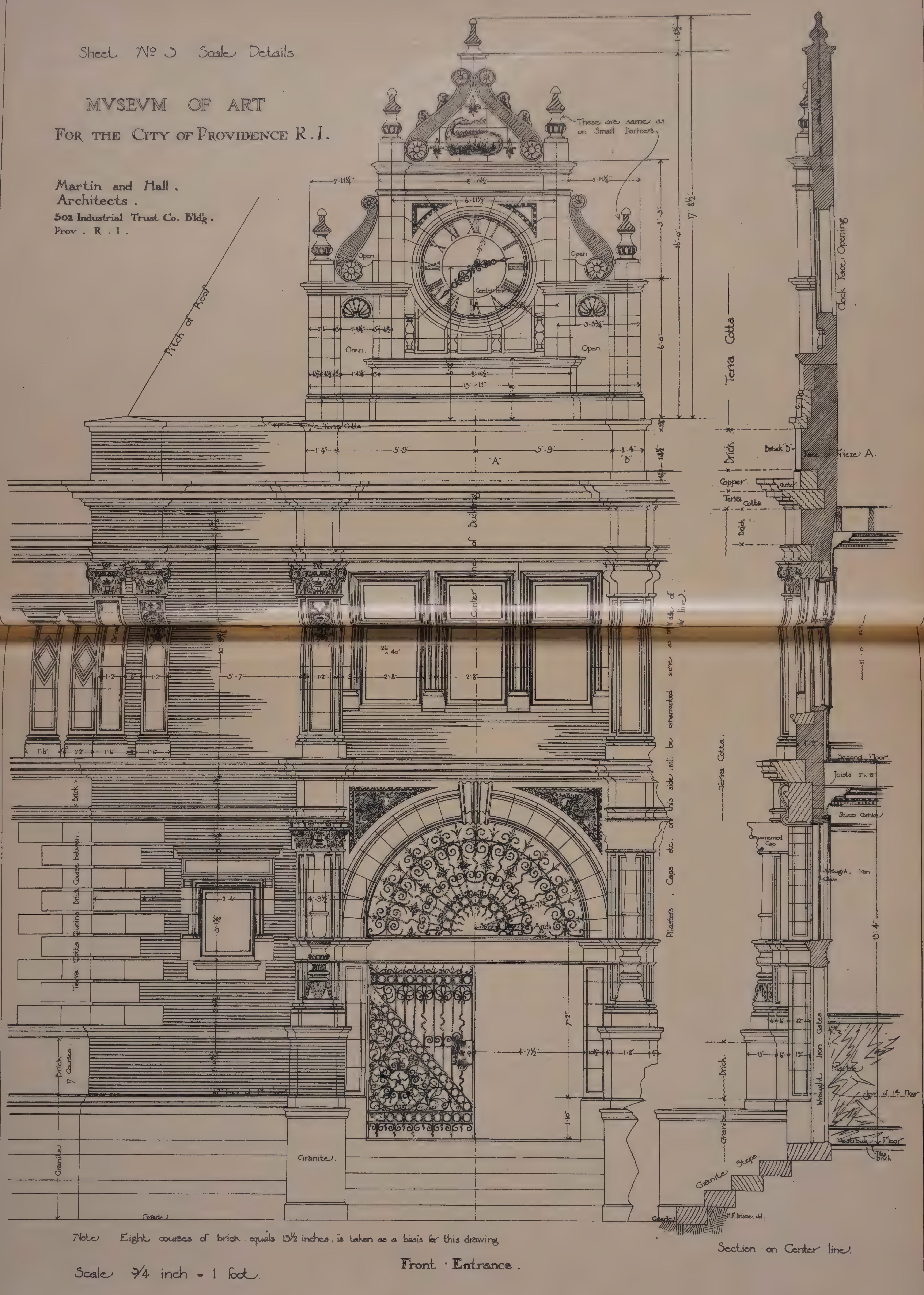
Sheet No 3 Scale Details

MVSEVM OF ART

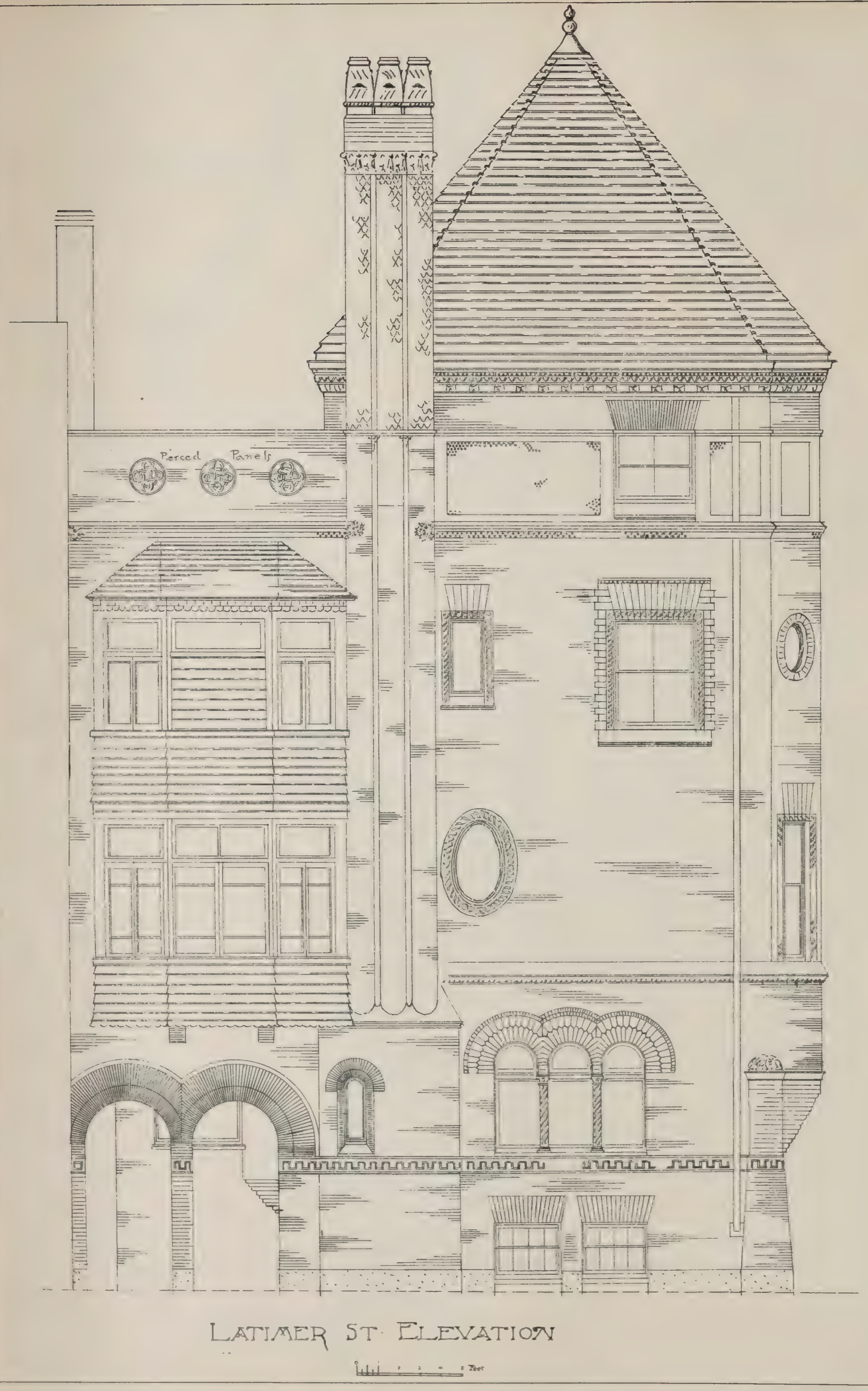
FOR THE CITY OF PROVIDENCE R. I.

Martin and Hall,
Architects.
502 Industrial Trust Co. B'ld'g.
Prov. R. I.

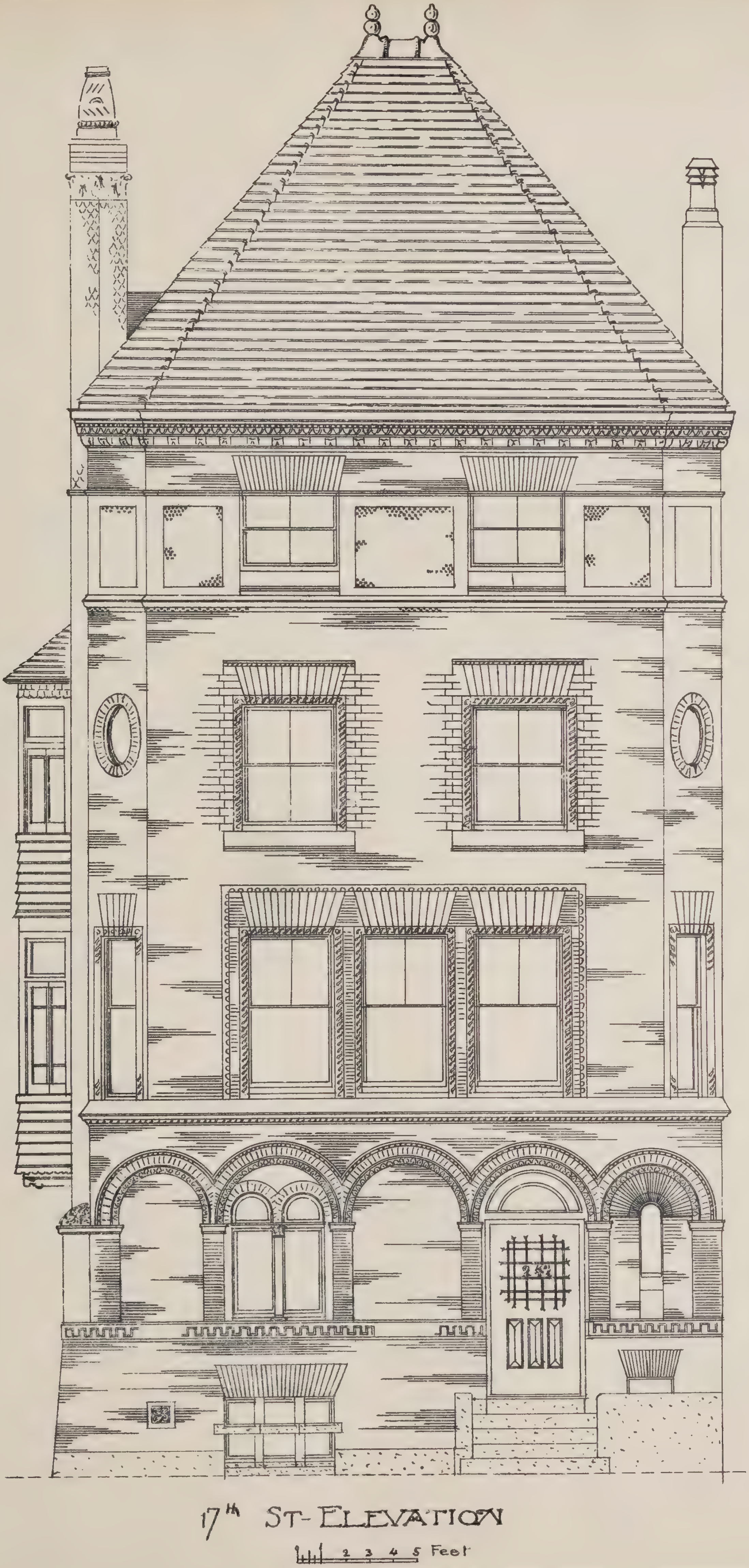




DETAIL FROM MUSEUM OF ART FOR THE CITY OF PROVIDENCE.
MARTIN & HALL, ARCHITECTS, INDUSTRIAL TRUST BUILDING, PROVIDENCE, R. I.



RESIDENCE OF MR. H. A. LEWIS, PHILADELPHIA.
MR. W. WHITNEY LEWIS, ARCHITECT, 85 WATER STREET, BOSTON.



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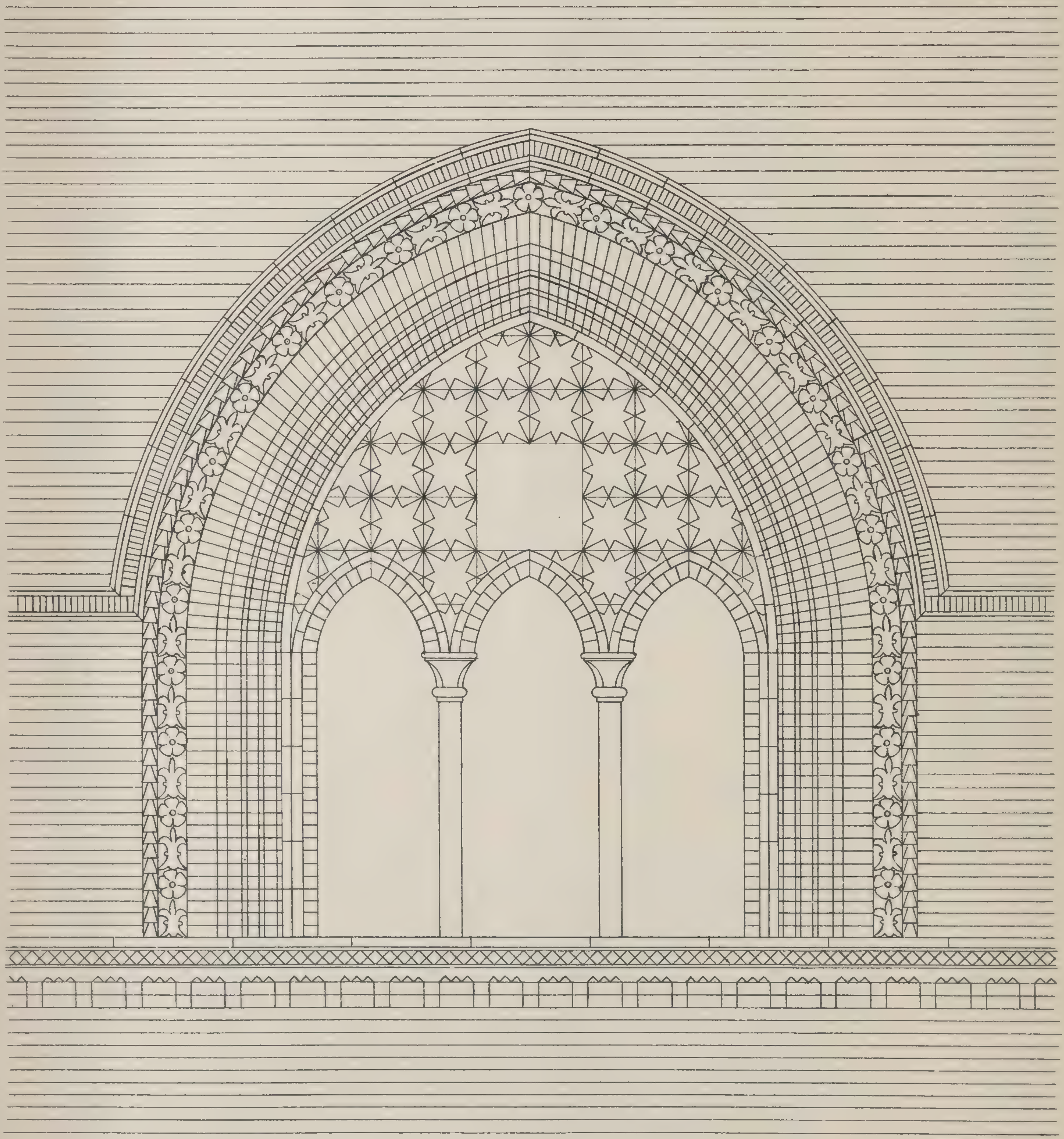

WINDOW IN PALAZZO DEI GIURECONSULTI, CREMONA.

THE BRICKBUILDER.

AN ILLUSTRATED MONTHLY DEVOTED TO THE ADVANCEMENT OF ARCHITECTURE IN MATERIALS OF CLAY.

PUBLISHED BY

The Brickbuilder Publishing Company,

CUSHING BUILDING, 85 WATER STREET, BOSTON.
P. O. BOX, 3282.

Subscription price, mailed flat to subscribers in the United States and Canada	$2.50 per year
Single numbers	25 cent
To countries in the Postal Union	$3.00 per year

COPYRIGHT, 1893, BY THE BRICKBUILDER PUBLISHING COMPANY.

Entered at the Boston, Mass., Post Office as Second Class Mail Matter, March 12, 1892.

THE BRICKBUILDER is for sale by all Newsdealers in the United States and Canada. Trade Supplied by the American News Co. and its branches.

PUBLISHERS' STATEMENT.

No person, firm, or corporation, interested directly or indirectly in the production or sale of building materials of any sort, has any connections, editorial or proprietary, with this publication.

THE meagreness of statistics regarding the clay industries of the United States is not to be wondered at, when one considers how difficult it is to get the average clay-worker interested in his own business, in a broad-minded way. How many consider that any advantage resulting to clay-working as an industry directly benefits them? or, *vice versa*, what brickmaker, in securing a large order, thinks of the benefit that individual order is to the whole body of brickmakers? It is high time definite statistics of the clay-working industry were compiled, but we would like to see this done by any method short of one similar to census-taking. The statistician who dreams of having blank forms filled out and returned by mail may have hope so long as funds are available for postage, but funds are not without limit. THE BRICKBUILDER is experimenting upon gathering certain statistics, not so much as to brick-making as the brick market. Whether any one of the several methods now being tried will be even partially successful is still a matter for conjecture. But the experience is worth something, and unless some one invents a way that will get returns from more than twenty per cent (the result of Secy. Randall's circular canvass over a picked list), there is considerable room for more of it before the National Association puts good time and money into the work.

THERE is an increasing tendency among architects to use standing exhibits of building materials, and especially of brick. This is very easy to account for, and the wonder is that manufacturers have not been quicker to realize the fact. Every one who is familiar with architects' offices knows how difficult it is to keep them in good order, to prevent drawings from being soiled, and to do away with dust accumulators. A brick is the worse kind of a dust accumulator. Its texture prevents its being wiped or dusted clean, and when one brick is piled on another, the trouble of moving each one to clean it even once a month is so great that it is left alone. One prominent architect in this country, not more than three hundred miles from New York, has recently thrown away his whole stock of samples, because a large manufacturer has established a complete display close at hand. This the architect consults whenever he wants to select a color. There he finds a whole panel laid up, and no man has been allowed since to leave a sample brick in his office. It is much easier for an architect to visit a display where he can see a large variety, than to put up with the constant cluttering of his office. Every new job brings a new set of samples. For some curious reason, however, the old ones are not thrown away. It is soon forgotten who made them, what they cost, etc., so that in case the architect should want to use a certain brick among his old samples the difficulty of placing it is a greater obstacle than calling for a new line of samples. In Philadelphia, in Brooklyn, in Chicago, there are well arranged and managed material exhibits. In other cities enterprising manufacturers make their own exhibits, but to see a reasonable proportion of them requires a great deal of travelling and time from the architect. Would it not be a wise plan for brick manufacturers to coöperate in establishing in central locations an exhibit room where all would have an opportunity to display their brick? It would insure getting a full examination, by the architect, of the bricks in the market, which is seldom the case at present.

BELT COURSE, VOLTA BUREAU, WASHINGTON, D. C.
PEABODY & STEARNS, ARCHITECTS, BOSTON. PERTH AMBOY TERRA-COTTA CO., MAKERS.

THE matter of color in brick and terra-cotta is now so well in control that an architect willing to give a little attention to experimental work can count upon getting from any one of the large manufacturers exactly what he wants. It is often the case that he selects one or the other from some sample at hand, and requires a match in the material which he has not selected by sample. When an architect makes such a selection he should try to get the kind of brick he wants, and let the terra-cotta manufacturer do the matching. The principal reason for this is that in brickmaking clay must be mixed to produce the desired color when burned, while in a piece of terra-cotta the exact color can be obtained by "slipping." The slip is a coating applied by a machine on the principle of the atomizer. A creamy paste of the slip clay is mixed and placed in a receptacle, through the top of which projects a tube running down into the paste. Across the open top of this tube a jet of steam is forced, which draws out the paste and sprays it over the piece of green terra-cotta. When this is done the terra-cotta has a secure coating of the kind of clay necessary to give the right color when burned. This process renders it comparatively easy for the terra-cotta manufacturers to produce the exact shade desired by the architect, so that if it comes to a question of matching one with the other, as is now being done to a greater extent than formerly, let it be the brick that is first selected.

APROPOS of this subject of color, we would suggest that forsaking the hot yellows and fire-flashed brick for the cool pearl grays that several makers are putting on the market would be occasionally a welcome change from what is getting to be monotonous.

How many of our readers are there, who know the Century Club in New York, who would take the warm yellow brick forming the party wall, in preference to the softer gray that is used on the façade and comes in direct juxtaposition with the yellow in the "return" of the façade on the east side? Some of these gray brick, especially Roman size, with a mortar of a slightly darker shade, go charmingly in the plain wall of a building whose trimming is of white or very light terra-cotta.

A "BRICKBUILDER" COMPETITION.

A SUBSCRIBER to this paper authorizes us to offer $175 in prizes for a competition similar to those which have from time to time been given by The Brickbuilder. These we have decided to divide into first, second, and third prizes, of $100, $50, and $25 respectively, open to all architects and draughtsmen, whether subscribers or not. It is probable that several "consolation" prizes in the way of books will be offered by the paper itself.

The programme selected is a very interesting one, and moreover, one that is decidedly practical.

It is supposed that a New York owner of a city lot, forty feet wide and one hundred feet deep, wishes to build thereon a dwelling of four stories, basement and cellar, the material of the façade being brick and terra-cotta. If at any future time he should sell this property, it might bring a better price as *two* houses than as *one*. Therefore a special condition of the problem is that the plans shall be so drawn that the house can at any time, and at a moderate expenditure, be altered over into two dwellings, each twenty feet wide; and in deciding the competition preference will be given, other things being equal, to that set of plans which, while maintaining the unity of the general design, most nearly fulfils this special requirement. Plan of each floor and an elevation to one-fourth-inch scale will be required, and must be sent to the office of The Brickbuilder, on or before June 1, 1894, carriage prepaid. A competent jury of three architects will make the award. The Brickbuilder reserves the right to publish any or all of the designs sent in. Further announcements concerning this competition may be made in the April and May issues.

PANEL OVER WINDOW, VOLTA BUREAU, WASHINGTON, D. C.
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STRUCTURE AND MATERIAL IN HIGH DESIGN.

OF the many problems suggested by the modern high office building, few are more interesting or important than those which relate to the expression of structure and material in the design. In reality this is only a portion of the problem presented by the high building, but it is important enough to warrant some special study apart from the other elements that enter into it.

First of all, however, it is necessary to premise that the high building is something entirely new under the sun. It corresponds to needs essentially modern, the conditions that call it into existence are modern, its system of construction is modern, the elevator service that gives it rentable value is a modern device. Viewed from every standpoint, the high building is wholly new.

Now, it is clearly reasonable to maintain that in attacking a new problem neither the architect nor any one else is bound to hamper himself with ideas and methods that, in their origin, are applicable to old things. Up to within less than twenty-five years ago the architecture of the world has been a horizontal architecture, into which width entered as the leading element. The modern office building is essentially vertical. This is another new element in the problem, and which further most unmistakably suggests that the vertical treatment is the only rational system on which to design a high building, — a system, by the way, that Messrs. Adler & Sullivan entirely understand, and which they have applied with enormous success to their Schiller Theatre in Chicago and to their Wainwright and Union Trust Buildings in St. Louis. I am not, however, concerned with the general question of the artistic treatment of the high front, but only with that portion of the problem that relates to the expression of construction and of material. It is, however, well not to divorce this portion of the question entirely from the general problem.

The high building being entirely new as a building, and in the method of design, the architect who would correctly and successfully solve the problem of its artistic expression must begin his task by ridding his mind of all preconceived notions. When one undertakes to learn a foreign tongue one only recalls one's native tongue sufficiently to help him in his studies. One does not quarrel with a foreign speech because it has not the grammar and methods of one's natural speech. So in the high design, the architect may check his work, as it were, by the experience he has gained in the studies he has hitherto made in low or horizontal design, but it is entirely a false notion to assume that the rules and methods learned in one are to be applied to the other. One does not take Gothic ideas for Renaissance designs if one would produce Renaissance work. So while the architect need not forget all he has learned in other work before beginning his high design, he should most emphatically keep well in mind the fundamental fact that he must not hamper himself in his new work by his previous knowledge.

"Structure in design" is a broad and general statement. If we build walls of rubble work and cover them with plaster, we get the structure on which the larger part of Egyptian architecture was based. If we use another style of decoration, we have the basis of Greek wall treatment. If we use columns and entablatures to face our rubble work, first covering it with slabs of marble, we have the basis of Roman art, and the same process was used by the Byzantine builders. Not until the Gothic period was the structure of the building freely, frankly, and openly expressed in the design. Yet no one thinks of complaining of the Egyptians, the Greeks, the Romans, the Byzantines because they did not wholly show the stones of the cores of their walls on the outside. No one quarrels with a wall ten feet thick faced on the outer surface with fine polished stones, but inwardly of rubble and cement. It is true the Romans went further than this, and that their outer thin marble veneers were a system of deceit more deliberately practised than the world had previously seen. But if we do not like it we may moralize on it briefly, perhaps, and then pass on to admire the great and splendid works produced in it. The single point to remember, and it is interesting in itself apart from its application to the modern high front, is that construction has been more or less covered up in architecture until the Gothic period. If this be the true test of sound architecture, then there has never been a true architecture save the Gothic.

The truth is, there is a point beyond which the demand for construction cannot be pushed, and becomes not only unnecessary, but absurd. So far as the contents of walls and of supporting members are concerned, there is a long array of precedence that tells us it does not matter much what is in our walls if they but stand upright and perform the functions for which they were built. It is well to keep this in mind, since there is a prevalent notion that until the construction of the high building is expressed in the façade we can have no good design, and that the "solution" we are all anxiously awaiting for can never be reached until this is done. The history of architecture shows this condition never to have existed in the past save in one instance, and if precedent is of any value at all it implies that this strange, new notion — for that is just what it is — shall not now be erected into a cardinal principle. All that architectural history teaches us in this connection is that *structural lines* are followed in the finest examples of the most successful styles. And this is all we need in the high commercial design.

Current architectural practice tolerates a considerable variety of methods for use in the high building. There is, first of all, the steel skeleton system, in which all the loads and walls are carried on a steel frame, and the walls themselves are mere curtains. Then there is the brick or stone construction, in which the walls carry the weight of the building without the assistance of a steel frame. Lastly, there is a mixed system, in which both the steel and brick construction are used, the former for the interior of the building, the latter for the outer walls, or exclusively for the façade. Purists will doubtless insist that the steel skeleton is the only proper one to use, since it is the most logical. In this they may be right, though the matter is perhaps more one of expediency and of circumstance than to be decided by off-hand rules.

Unquestionably, however, the high building is naturally a steel construction, so far as present methods seem to go, and this being the case the wiseacres maintain that until this is expressed in the design we can have no good and successful design, thereby insisting, we should note, upon a limitation that has never yet been insisted upon in architecture save in the Gothic.

Iron is a new building material. As yet we have scarcely done more than begin to learn its architectural properties. Not very long ago it was the custom to build iron fronts, and most horrible things they were, in their simulation of stone. This fashion has, fortunately, almost disappeared, and, instead of putting our iron on the outsides of our building, we put it inside, where it will do the most good, and where, as an accessory, it naturally belongs. Thus it was that an iron building of twenty-five years since was wholly iron externally, while the steel-construction buildings of the present day give no hint of steel in their exteriors. And it must be in one or the other place, inside or outside; there can be no middle course, for the moment we place our iron, part outside and part inside, we have a condition of architectural intolerableness.

I am quite ready to admit, were argument necessary, that the first attempts in iron construction were not fair from the standpoint of artistic design. The architects of a quarter-century since were not the students that now form the body of the profession. Architectural art in general was scarcely understood, and architectural art in a new material not at all. It was, therefore, perhaps natural that iron buildings should have the form of stone ones, and it is quite as natural that they failed. A new material implies a new method of use, and finds its natural forms in new uses. Applied to a store front, it was a new material in an old place, and was early destined to failure. The fact that iron can be moulded like brickwork or stone, and that brick and stone can be imitated in it, in a measure, is no reason why it should be done. The mere ability to do a thing carries no virtue with it. Nor are we to conclude that, because a higher grade of culture and the possession of new devices and modes of working enable us to create a new form of building material, we must henceforth discard the old and take up with the new. Rather a more rational procedure is to use the new to help the old, as nature does in her every phase. Then will the product of the later culture be an advance on that of the earlier, and the law of natural progress be satisfied. And this is exactly what happens when the steel skeleton helps the brick and stone walls of a high building by carrying its weight.

The structural steel columns being encased in piers of terra-cotta, the utmost requirements of construction and of art are obtained. The structural lines are maintained; the piers not only seem to be piers, but are piers. History calls for nothing else; why should the modern architect, battling with the most difficult problem ever presented to any architect in any time, — the high problem without proportionate width, — try to complicate his task by following arbitrary requirements that were never insisted on before? The integrity and expression of the piers are marred, not by hiding the steel core in a facing of terra-cotta, but by running horizontal lines across them, by interrupting their upward tendency, and endeavoring to reduce their apparent dimensions. All these things are being done, but because they are done does not make them right, even when done by those who should know the right way of doing things. Verticality, in truth, is not only the natural and rational method of high design, but it is the only way in which the structure can appear in it. All architecture teaches this, and though in the high design we must throw away many things that past work makes clear to us, we are not called upon to cast aside principles that will help us. If we would rid ourselves of old ideas that we cling to only because they are old, we must do so with a reason and not from pure zest for novelty.

Such is my comprehension of the problem of expression of material in the high design. It is, perhaps, a not unnatural thought that material and structure should have direct and visible expression in the design of the modern brick-and-steel or steel-and-terra-cotta high building. But the history of architecture gives us no authority to insist on this point, and, while purity of expression and honesty or construction are always to be recommended, there is neither sense nor use in asking for something the conditions of building do not permit. Neither theory nor practice shows a clearer way of expressing material and structure in the high design than by a development of the vertical structural lines. The vertical supports are the distinguishing feature of the construction; they are the new elements, and the fact that they support the whole building renders them, in a theoretical as in an actual sense, more important than the horizontal floor lines. We cannot interrupt the vertical lines for that reason, and, for the further one that such interruptions are æsthetically unpleasant, deprive the structure of homogeneity of idea, and introduce discord and division that utterly destroys the unity which is a prime essential in a high design, and which should not be forgotten in horizontal design.

No one will maintain that the skeleton is the highest type of human beauty of form, nor that the general good looks of humanity would be increased by external preponderance of bone. Yet the steel frame is the skeleton of the building in almost exactly the same way that the bones are the skeleton of the human form. What is satisfactory for the one should be satisfactory for the other. When the steel frame is covered with its terra-cotta coating, and when the lines thus formed are expressed in the design, — dominate the design, in fact, — the utmost requirements of reason and of art have been fulfilled. The fact that these vertical lines are generally of greater width than the simple covering with fireproofing would call for does not affect their value nor their expression. An increased width is necessitated by æsthetic requirements, and every designer is fully aware of the advantages he may derive from such width.

The expression of material and of structure in high design will not be helped by arbitrary limitations. Art is by nature free, and it is only when it is held within bounds that it fails to rise to its utmost height. Commercial design of every sort, and especially the high form, is hampered by innumerable conditions, limitations, and circumstances that render the artistic treatment of the problem one of extreme difficulty. Every additional effort to increase the difficulties of the architect in this work is another step hindering its solution. Instead of limiting the architect, let us give him fair play, lessen his conditions as best we can, and leave him to work out his problem — which is a new one — in a new way. His chances of success will certainly be better than if he were to be told at every point, like some wilful child, that he "mus'n't do this," "mus'n't do that." The noble and manly art of architecture will not thrive under such treatment.

The manifest superiority of terra-cotta for high buildings need not, I presume, be argued; for though the high building is a type of to-day experience has already demonstrated the great superiority of this material in this place. Employed as a fireproof covering to the steel supports, it performs a natural and valuable constructive duty and makes it possible to employ the steel in supporting the weight of the building. Given an external form that permits the expression of the vertical supporting members in an artistic and logical manner, it is doing all that can be asked of it æsthetically. Substitute some other material for the terra-cotta and the net result is the same. The question is not that of the use of materials, at all, but of the manner of design. When the vertical element is consistently handled and with a fine artistic perception of its uses, such as may be seen, for example, in the Schiller Theatre, the questions of expression, of unity, of truth, of art, are entirely and completely answered.

Whether our modern architects have yet wholly grasped the proper use of terra-cotta in the high design may, I think, be most properly debated. The material of the Schiller Theatre, for example, approximates stone almost too closely, and thus has a deceptive effect that the stickler for material may justly criticise if he is disposed to do so. But this is quite a different question from maintaining that the modern high building is a union of two sorts of building material, — steel and terra-cotta, — neither of which has its full and real structural value. What this may be the advocates of "expression" are not always careful to tell us. The argument, however, starts from an illogical basis and is not supported by history. Surely in this case the modern architect need not concern himself with it.

The student of the use of terra-cotta in high buildings has no need to concern himself with the problem of giving structural and visible forms to the two materials that, when naturally employed, stand to each other in the relation of envelope and core. There are many practical points in its use which may be much more profitably discussed than this, and there is much the architect has to learn in its use. Everything that will help to diffuse this knowledge will help the improvement of high design, and that is grievously needed in some quarters. Meanwhile it is sufficient to point out that a considerable advance will have been made when the value of the vertical in vertical design has become generally recognized, and its value in expressing both structure and material is fully known.

BARR FERREE.

THE Powhatan Clay Manufacturing Company announce that Clayville, where their plant is located, has been made a regular freight and passenger station, a postoffice has been established, and the Southern Express Company and Western Union Telegraph Company have opened offices there. The Powhatan Company requests that all communications and shipments formerly marked "Dorset" should now be marked "Clayville," and freight should *not* be prepaid unless so ordered.

ARCHITECTS having special problems in fire-proofing to solve are requested to consult the editor of THE BRICKBUILDER, who will see that they are promptly referred to experts and answered as completely as possible either by correspondence or through the columns of the paper.

THE BRICKMAKERS' MARKET.

INTRODUCTION.

IT is the purpose in this department of THE BRICKBUILDER to take up matters on the market side of the brick manufacturers' business. The technical details of manufacturing are already ably and thoroughly covered by our contemporaries, *The Clayworker* and *The Clay Record;* and they are, futhermore, save in a most general way, beyond our province. THE BRICKBUILDER, being essentially a brick *consumers'* paper, is on that account pre-eminently a publication covering the selling interests of the brick *producer*. It will therefore be the purpose of this department to keep manufacturers in touch with architects and builders, to post them on new shapes, colors, and textures coming into popularity, and likely to be in vogue, and to give timely information as to what the majority of architects will want. In this department attention will also be called to those other parts of the same issue which manufacturers can use in increasing their sales, and suggestions made as to the various ways of using them. Articles upon the delivery of bricks, covering all points in which care is an advantage, will be contributed by practical manufacturers who have given delivery special attention. Local associations, and their success in controlling prices, will form the subject of a series of articles in which both sides will be considered. In this particular department the interests of the average manufacturer will be considered. The several large companies manufacturing extensive lines of front and ornamental brick have each a carefully developed sales system particularly adapted to their special needs. This part of their business is in the hands of men who give it their whole attention and who have years of experience in just this line of work. It is the man who must superintend all departments of his business to whom we hope to make these columns useful, and we respectfully solicit a year's trial, believing we can in that time fully establish our claim to his patronage.

THE MARKET SIDE.

THE first question the intending brick manufacturer asks himself, when he finds he has material at hand, is whether or not there is sufficient market to support a business. In the preliminary work this question occupies a paramount place. Its answer decides the amount of capital required, the character and amount of machinery purchased, the drying and burning facilities, and the numerous minor considerations in the way of equipment. But as the plant is installed, and the processes of production gradually taken up, the interest centres on the technical details as the all-important ones, and there it usually stays. As the years roll by, the manufacturer, providing he is fairly successful and continues in business, devotes more or less attention to the improvement of his plant, changing machinery perhaps, improving or increasing his dryer or kiln capacities, varying his methods of producing and keeping pace with the natural demand for brick. But does he not lose sight of the fact that all improvements leading to increased output are the result of a larger market? The market side again takes precedence. In fact, it is the all-important consideration. There are thousands of good clay beds, the development of which is out of the question. There is no question as to the ability to successfully work them so far as the product goes, but the absence of a market for this product is an insurmountable obstacle to their development.

It may be safely said that in these days the only limit to production is the demand for brick. Machine manufacturers will equip and guarantee any desired capacity of a factory. Is it not, therefore, to the increasing of the demand for their material that manufacturers desirous of building up their business should give their attention? A demonstration of the importance of the market bearing is the recently developed paving-brick industry. Large plants are now devoted exclusively to the manufacture of paving brick to supply a rapidly increasing market. Were it not for the work done by men enthusiastic over this new use of brick in getting it adopted for city pavements, in where would be the occasion for manufacturing? It is a *new* market and *must* be pushed. Because the use of building brick dates from the earliest days of history, is it so common that at the present day nothing can be done to infuse new life into the industry?

It is the duty every brickmaker owes to himself and to his art to use every legitimate means to secure the use of brick wherever it can be substituted for other materials. He has everything in his favor, except, possibly, cheapness. To offset this, he has both artistic and constructional superiority. If he will only take the trouble, he can present such an array of convincing arguments in favor of his material as to influence any reasonable owner.

There are innumerable instances constantly arising, where the brickmaker might increase his sales by a few thousand here and a few thousand there, if only he were fully alive to every possible use of brick. These sales would be absolutely clear increase, because without his effort brick would never be used.

Is it not, therefore, of equal importance to consider the market side constantly, as the one means largely within control of increasing business. Take care of your market, and your production will take care of itself. The true brickmaker will get work out of the plant at his command, and his balance will be on the right side, *if he has a market*. The finest equipment in the world is without avail, if the market is lacking. But if you can increase the demand, you are justified in putting in new and improved machinery, to enable you more quickly, more certainly, and more economically to supply this demand. If a certain machine will increase your profit by reducing the manufacturing cost per thousand, and if you can increase your sales, there is all the more reason for investing in that machine, simply because it gives you a greater profit on these increased sales, as well as upon the ordinary sales. But if your market is limited, the question is whether the saving on the limited output will repay the interest on the investment and the deterioration of the machine, and give you a balance.

BRICK SCHOOLHOUSES.

BRICK is the material of all materials for schoolhouse architecture, and it is of interest to the manufacturer of common brick to know that some of the finest schoolhouses of the city of Boston are built of good hard common red brick. A schoolhouse must be treated simply. Of the many designs that have appeared in THE BRICKBUILDER, almost all show the simplest possible working out of the design. A fine front brick used under such conditions is apt to give a hard mechanical effect to a plain building that is anything but pleasing, especially as front brick, except in the mottled varieties, are usually sorted for color. Common brick as they run give just enough variety and roughness of texture to a wall to take away the unpleasantness of a perfectly smooth and evenly colored wall. This is a fact now almost universally admitted by architects. In stating it we are aware we are treading on some toes. But to the manufacturer who still believes that brick must always be sorted to an even color, and that for fronts of walls a smooth pressed brick must be used, we would say that the large manufacturers who are producing for the leading architects in the principal cities are offering the widest range in colors, for the production of variety in wall surfaces. A certain large Eastern company offers eleven distinct shades of one color. An architect desiring considerable variety can have them all mixed in; if he desires a more even effect, but with still some variety, he may mix the first six shades if he wants the lighter run of the color, or the last six shades if he wants the darker run. Or he may wish to use a diaper decoration, in which case he can select his shades so as to get just the degree of contrast desired. This is, perhaps, wandering from our subject, but it is introduced to show the universal leaning, in architectural centres, towards variety of color and texture in brick walls. To return to our subject, we want to suggest that manufacturers wishing to influence school building committees to use brick, should write to us, and we will by return mail send them a selection of back numbers of THE BRICKBUILDER containing designs by architects who are specialists in schoolhouse work; every one of these designs is a strong argument for the use of brick, and without any cost whatever to the manufacturer we will place this matter at his disposal. The design, of which two views are shown on plates 18 and 19 of this issue, is a case in point. Many of these designs are out-and-out, common brick designs, while others show combinations of front brick and terra-cotta.

A BRICK INSTEAD OF A WOODEN VERANDA.

IT is not unreasonable to estimate that ninety-nine out of every one hundred brick houses built in this country have wooden porches or verandas if they have any at all. It is even so with many residences of brick manufacturers of which we have personal knowledge. Here is an opportunity for improvement. One of the most effective uses of brick is in the construction of arcades. The piers may be of stone, or terra-cotta, but they may just as well be of brick, with possibly a terra-cotta capital. Such a feature, on a brick house, adds wonderfully to its appearance. It is more expensive, it is true, than a wooden construction, but not enough so as to be considered out of the question except in the most economical construction. A reference to plates 18 and 19 of this number will show the great effectiveness of this treatment of a porch or veranda.

Often it is desirable to have an uncovered porch, and in such a case, providing the house is brick, there is no reason why the porch railing should not be brick.

AN instance where THE BRICKBUILDER has been of service has been brought to our notice by F. Codman Ford of New Orleans, the pioneer of that section in the clay-building materials line. Mr. Ford writes us that features of one of our prize designs for $2,000 brick houses are being embodied in a brick house in process of erection by a real estate improvement company in New Orleans. Mr. Ford has made good use of a number of copies of this special number and at least one copy should be in every brick manufacturer's office, if only to show possible builders ideas for artistic brick houses. These designs were the result of a competition, and a competent jury selected eight out of a large number. Plans, elevations, and details of each design are published in our special double number. It is sent postpaid on receipt of twenty-five two-cent stamps.

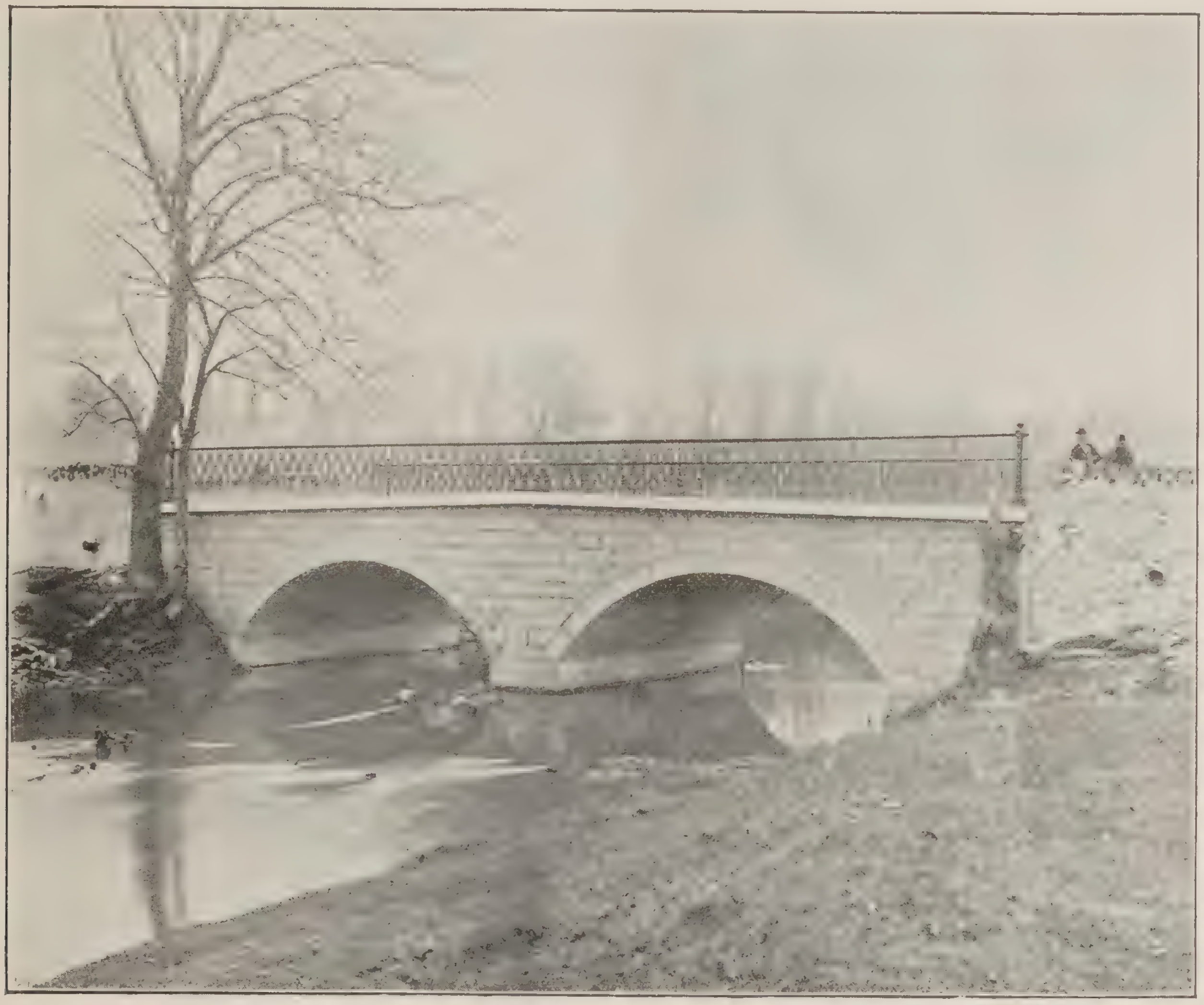
BRICK manufacturers who are interested in increasing their local market are requested to write to the editor of THE BRICKBUILDER and offer suggestions of ways in which the paper can be of practical use to them in this direction. Without these suggestions we must do our best and hope to please, but with them as a guide we have a definite basis upon which to work, and we are confident of success.

IT is often that people about to build have some prejudice against a certain material, and outside testimony is required to carry the point in its favor. An instance of this occurred recently, when we received from a Connecticut architect a list of certain issues of THE BRICKBUILDER containing articles upon terra-cotta, with a request that marked copies be sent to the members of a committee, whose addresses he furnished. He was trying to convince them that terra-cotta should be used for trimmings on a brick building, instead of brown stone, and applied to us for assistance. As it is the aim of THE BRICKBUILDER to advance the interests of architecture in clay materials, we want every opportunity to throw our influence into the balance, whether or not the request comes from a subscriber.

FOR SALE TO BRICKMAKERS.

About 1,800 twin pallets, five cars and two transfer cars, Chambers Bros. make. For sale cheap. Apply to
The Hercules Cement Company,
Catasauqua, Penn.

LIMES AND CEMENTS, MORTARS, AND MORTAR COLORS.



HIGHWAY BRIDGE OF CONCRETE, OVER PENNYPACK CREEK, PHILADELPHIA.
DESIGNED BY MR. CARL A. TRIK, SUPERINTENDENT OF BRIDGES.

THE above illustration from a photograph represents the newly finished, first cement bridge in America, built by the Department of Public Works of the city of Philadelphia. The following description is taken from the annual report of Mr. Carl A. Trik, the Superintendent of Bridges, who designed and superintended in every detail the construction of this bridge.

"Another successful progress in the construction of highway bridges — a novelty in our country — was created in this city during the past year, upon my suggestion, sustained by the chief of this Bureau, and with the consent of the director of the Department of Public Works, by the construction of a double-arched highway bridge carrying Pine Road over Pennypack Creek, entirely of concrete; foundations, abutments, centre pier, arches, and spandrel walls, all of one solid casting of concrete of the content of 1,008 tons.

"The work was performed under contract by I. H. Hathaway & Co. in best workmanship and with best approved material, according to my design and specifications, approved by the director of the Department of Public Works, at a cost of $8,642 for the entire bridge, including appurtenances; and of $646.12 for thorough renovation of the retaining walls on both approaches.

"Against the cost of $8,642 for the concrete bridge, there stood the lowest bid of $11,300 for substituting a rock-face ashlar stone and brick arch bridge.

"By adopting the concrete bridge, the city saved the more cost of a stone bridge of $2,658 — that is, about 33 per cent of the expense — by comparatively equal durability of the structure.

"The bridge consists of two arched spans, each of twenty-five feet four and three-fourths inches, with a rise of six feet six inches; supported by concrete abutments and a concrete pier; and is built on a light skew. It is thirty-four feet wide out to out of parapets, and carries a twenty-six-foot-wide macadam roadway with two granite-paved gutters on concrete foundation, two feet wide on each side. The arches proper are two feet three inches deep at the crown and covered on top with a three-fourths-inch layer of Portland cement mortar. The spandrel filling consists of compactly rammed concrete. The spandrel walls and faces of the arches are moulded to represent ashlar masonry, and are afterwards pebble-dashed to show a rough surface.

"The abutments are seven feet, the centre pier six feet, and the spandrel walls three feet thick at the springing line and two feet thick at the top under the coping; the roadway lies fourteen feet six inches above the ordinary water surface.

"To strengthen the concrete work, wire nets have been placed on top of each layer, twelve inches square; the diameter of the wire in this netting is one fourth inch.

"One hundred and twelve (112) tons of best imported Mannheimer Portland Cement have been used for the concrete; this brand of Portland Cement was found especially qualified for the purpose of concrete casting on account of its perfect uniformity, intensive fineness, progressive induration after the first setting, and of its great tensile and crushing strength.

"The cement was carefully and well mixed with clean, sharp bar sand and broken hard quarry stone of the specified sizes, and clear water, in proportions varying so as to give the concrete the required compressive strength and resistance of the strains of the various parts of the bridge; viz., one part of cement to two parts of sand to six parts of broken stone, up to one part of cement to one part of sand to four parts of broken stone; the broken stones were varying in size from one cubic inch to three cubic inches.

"The roadway of the bridge was constructed of sixteen-inch-thick macadam on a hard stone base, with gutters of granite blocks on concrete foundation on both sides, each two feet wide; joints grouted with Portland cement mortar, and grate inlets at each end of both gutters, with pipe outlets built through the retaining walls, to discharge the surface water into the creek.

"When, three weeks after the completion of the concrete arches, the centring timbers of the arches and the other casings were taken off, there was not the slightest settling of any part of the concrete bridge visible; and when, about two weeks later, an eleven-ton roller was used for compacting the macadam on top of the arches for about ten hours, there was also not the slightest settling remarkable.

"On several examinations, after the bridge was transmitted to the use of the public, I could not discover any dislocation or cracking of the concrete structure."

"To Mr. James H. Windrim, Director of Public Works, we are indebted for a description covering the salient parts of Mr. Trik's report, and Mr. Windrim also adds the following analysis of the cement used: —

Moisture	0.17%
Combined Water	1.31
Insoluble Matter	3.15
Silica	18.90
Sulphuric Acid	1.71
Alumina	8.81
Oxide of Iron	2.81
Lime	60.82
Magnesia	1.88
Potash	0.56
Soda	1.35

The following table of average tensile strength of the cement is also furnished by Mr. Windrim: —

Neat.	24 hours in water,	393 pounds per square inch.
	7 days (one day in air),	579 " " " "
	23 days (" " "),	659 " " " "

Per cent of water, 22.8.

A physical test showed a residue of 5.5 per cent on a one-hundred-mesh sieve.

The construction of the concrete foundations, abutments, piers, and arches, spandrel and parapet walls, including the centres and casings, took about thirty-one working days.

NOTES.

CEMENTS showing a high tensile strength at a short period are not necessarily good; they will sometimes fail on a longer test, and are subject to contraction and expansion in volume, greatly injuring the works in which they have been employed. This is due to imperfections in their chemical composition or manufacture.

THE higher prices of some well-tried brands of cement, while a trifle higher than ordinary brands, are compensated for by greater strength, which permits of a larger addition of sand, thus making their actual use really cheaper than less expensive and inferior brands.

THE lime and cement dealers of Boston and vicinity have formed an association. Their first monthly dinner was held at Young's, March 14.

W. H. GATES of Boston has added to his other lines Wm. Connor's American Seal Mortar Colors.

JONATHAN CREAGER'S SONS of Cincinnati report that they have a new machine for the brick manufacturers that will be a winner when they put it out among the trade. From their description it will fill a long-felt want.

TRADE NOTES.

WE had a very pleasant call recently at the yards of the La Salle Pressed Brick Company and found them active in filling orders on special brick. They are getting out some new ideas in cornice designs that are very attractive and have the special feature of being of sufficient size to be effective when in position. We would lay particular stress on this last feature, as many attractive designs lose in effect by being so comparatively small as to be indistinct when set in position.

AT the office of the Cincinnati Pressed Brick Company we also saw some beautiful samples, and were shown equally fine specimens in some of the important buildings of recent erection in Cincinnati; proving that this company exhibits as samples only the sort of stock they expect to fill orders with. The renewal of business activity is being felt in their office, and, judging from the excellent quality of their brick, they will deserve increased sales.

WE are glad to learn from the well-known firm of Evens & Howard, of St. Louis, that the outlook for business has improved the last few weeks. They are receiving many inquiries and orders for their brick. It is not surprising that they should be among the first to feel the renewal of activity in trade. The standard of their brick warrants their popularity. The new catalogue, which will soon be out, is a gem in the way of illustrations, judging from the proof sheets. It has many new and attractive designs that will make it a very attractive reference book. W. H. Gates, at 30 Kilby Street, Boston, can show New England buyers samples of the Evens & Howard goods.

WHILE in St. Louis we had the pleasure of visiting the extensive yards of the Hydraulic Pressed Brick Company. We feel it would be little short of a revelation to some of our smaller manufacturers, could they but see the capacity of these various yards and the improved methods for making and handling brick. We were interested to learn that during the World's Fair some prominent German manufacturers of brick came down to St. Louis and went over the Hydraulic Company's yards. They came down with most exalted ideas of their own methods and systems, but before leaving admitted that they had much to learn from what they saw there. The new catalogue, which will soon be out, will be one of the most complete works of the kind ever issued. All the new designs are of the actual dimensions of the bricks represented.

M. F. WILLIAMS & CO. of St. Louis are getting out some new machinery in the way of a clay mixer and feeder combined that is meeting with great favor among the clayworking fraternity. It has, among other good features, a steam-heated bottom for warming clay while it is being mixed and fed. This is of great value in damp or frosty clays. Another machine that is very popular is their new shale crusher and grinder. This is designed to take shale from the bank in large lumps and reduce it to powder by one process. The manufacturers claim that this machine will do more work than two eight-foot dry pans, and the cost will not be greater than that of one dry pan. Also, that the shale will not be left in a flaky condition, but will be granular and flaky in form.

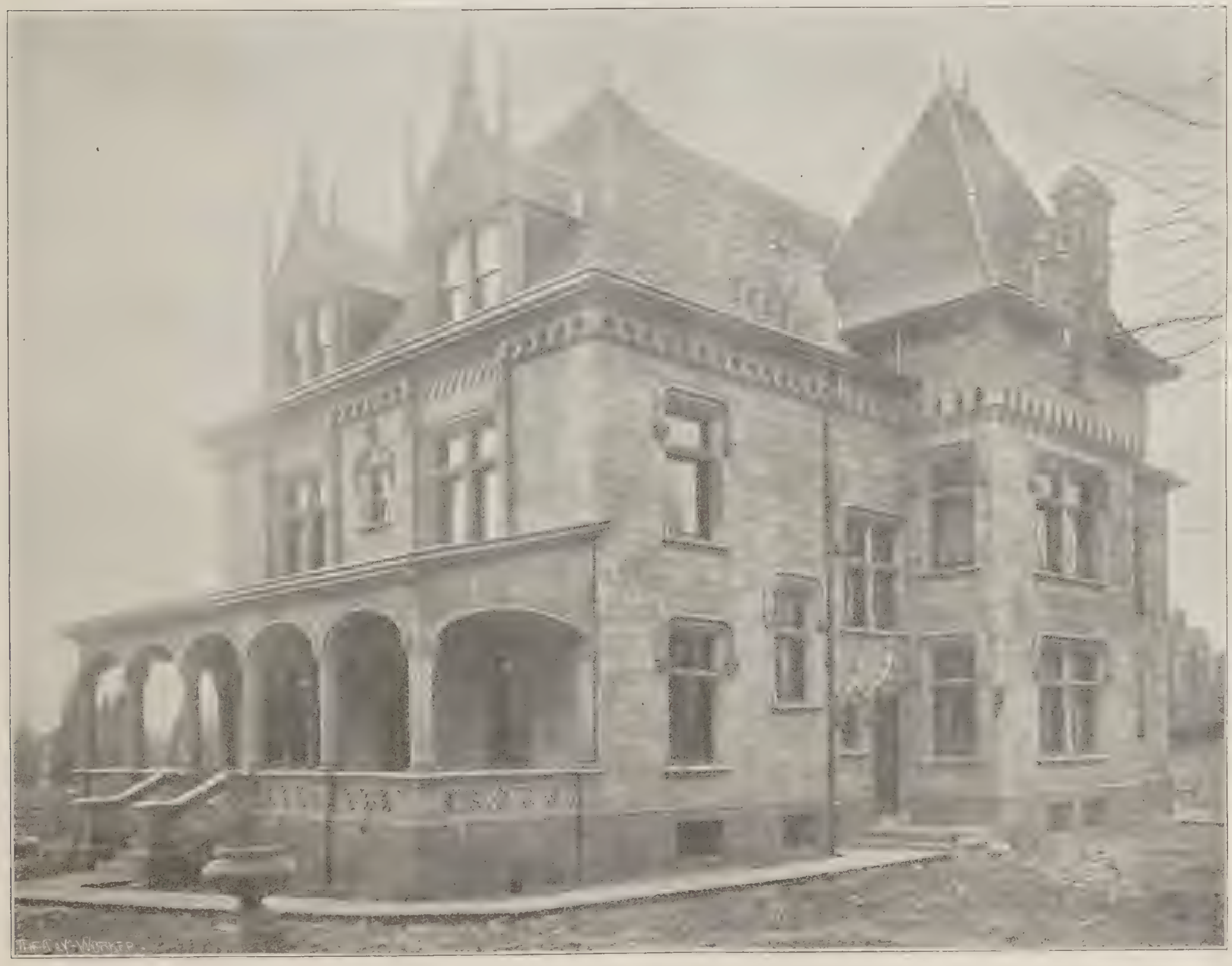
IN Indianapolis we found the Standard Dry Kiln Company quite settled in their new offices. They assure their friends that they are better equipped for business than ever. We congratulated Mr. Elliot on the evident activity in business at the time of our call, and we trust it may long continue.

THE Simpson Brick Press Company have moved from their old quarters to new and spacious offices in the Chamber of Commerce building. Their new location is certainly a most desirable one. We congratulate them on the increase of business which has made the change necessary. Notice came too late to change their advertisement, which was in the first form sent to press.

THE BRICKBUILDER

VOL. III. BOSTON, APRIL, 1894. No. 4.

A TERRA-COTTA RESIDENCE.



By permission of *The Clayworker.*

RESIDENCE OF W. D. GATES, HINSDALE, ILL.
MESSRS. JENNEY & MUNDIE, ARCHITECTS, CHICAGO.

WHEN "skeleton construction" is mentioned, Chicago appears to be naturally associated with the term. That system seems to have had its greatest development in this city, and, too, in an astonishingly short period of time. The first building to embody the idea was the Home Insurance Building, which was built in 1883. From the windows of its twelfth story can be counted to-day more than thirty office buildings, all ten or more stories high, at least ten of them having their façades entirely of terra-cotta (save in some cases the first two or three stories, which are stone), and all of them employing in a greater or less degree terra-cotta cornices, band courses, sills, lintels, etc., in the construction of their exterior walls.

So far as Chicago is concerned the extended use of terra-cotta as a building material is due to the almost necessity for its application in "skeleton construction." THE BRICKBUILDER will publish details later, illustrating the methods of construction of modern office buildings varying from the old system of heavy walls through various stages to the latest most highly organized steel structure covered from sidewalk to roof with a veneer of terra-cotta.

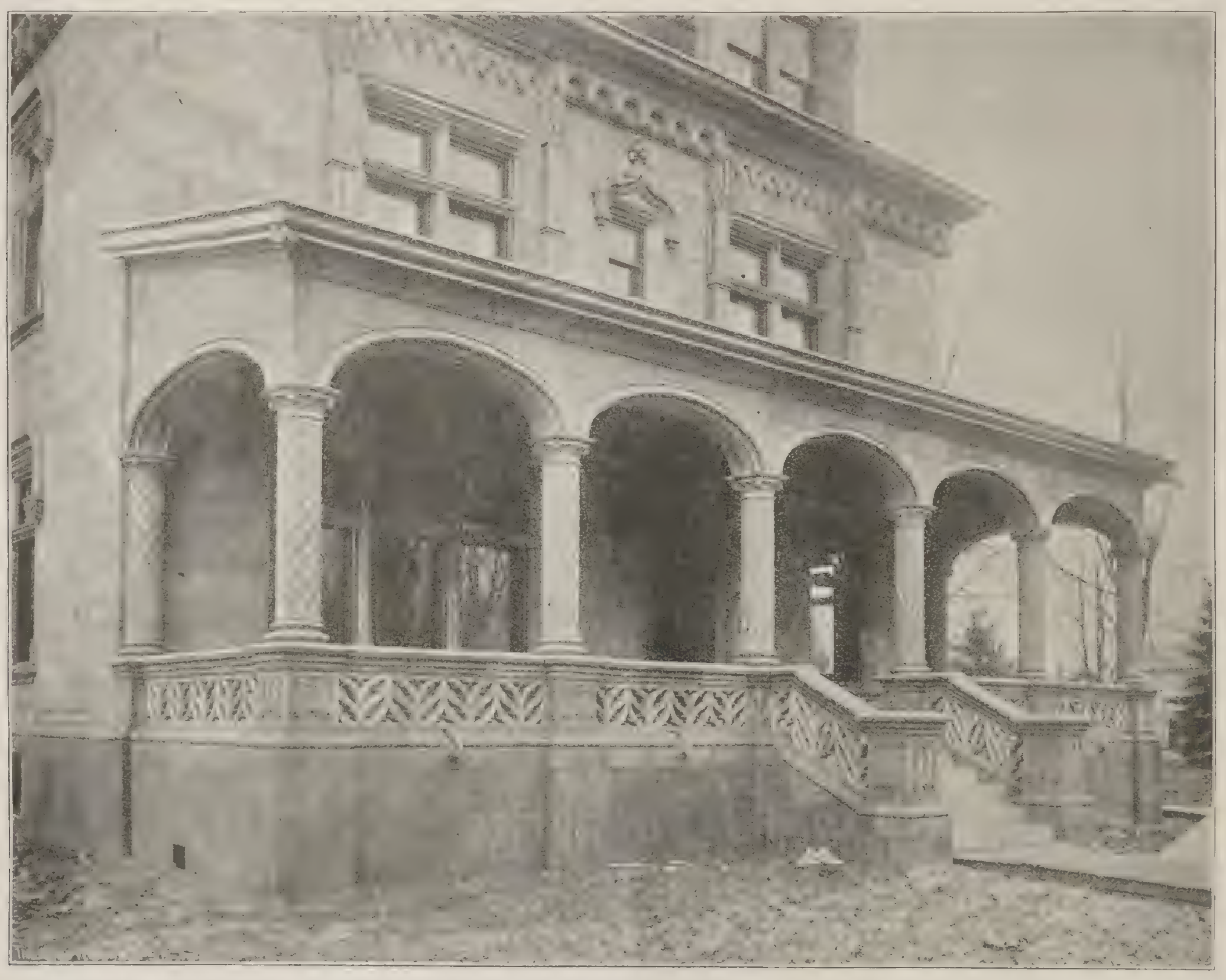
Terra-cotta is such an adaptable material for veneering steel construction, it is so easily moulded to fit an angle or an I beam, that even when pressed brick curtain walls and piers are used the natural recourse is to terra-cotta for sills, lintels, and mullions. This we say from a constructive standpoint, without considering terra-cotta as a medium for architectural possibilities not yet realized.

The purpose of this article is to illustrate the use of terra-cotta for minor buildings, taking a residence as an example. What more natural than for the president of a terra-cotta company to say, as did Mr. W. D. Gates of the American Terra-Cotta Company: "Why shouldn't I build my house of terra-cotta, instead of stone or brick?" No good negative answer could be found to that question, and a terra-cotta house in the charming suburb, Hinsdale, was the result. Illustrations are published herewith showing the exterior appearance of the house, together with some details of its construction.

If this house were for any other than a terra-cotta manufacturer, the cost would be naturally one of the first questions. Terra-cotta facing at present costs more than pressed brick, but as compared with Buff Bedford, the cheapest, best, and most commonly used cut stone in Chicago, the same design, executed in terra-cotta, costs ten to twenty-five per cent less than in the Buff Bedford limestone.

The foundation walls of this house are rubble limestone, coated outside with composition. The interior floors and partitions are ordinary wood joist and stud construction. The roof is of stained wood shingles, though by preference it would have been Spanish tile. The ridges, hip rolls, chimneys, and the entire exterior down to the ground level, are terra-cotta, excepting the steps, which are stone. Even the basement coal window sill, designed to be stone, was actually made in terra-cotta.

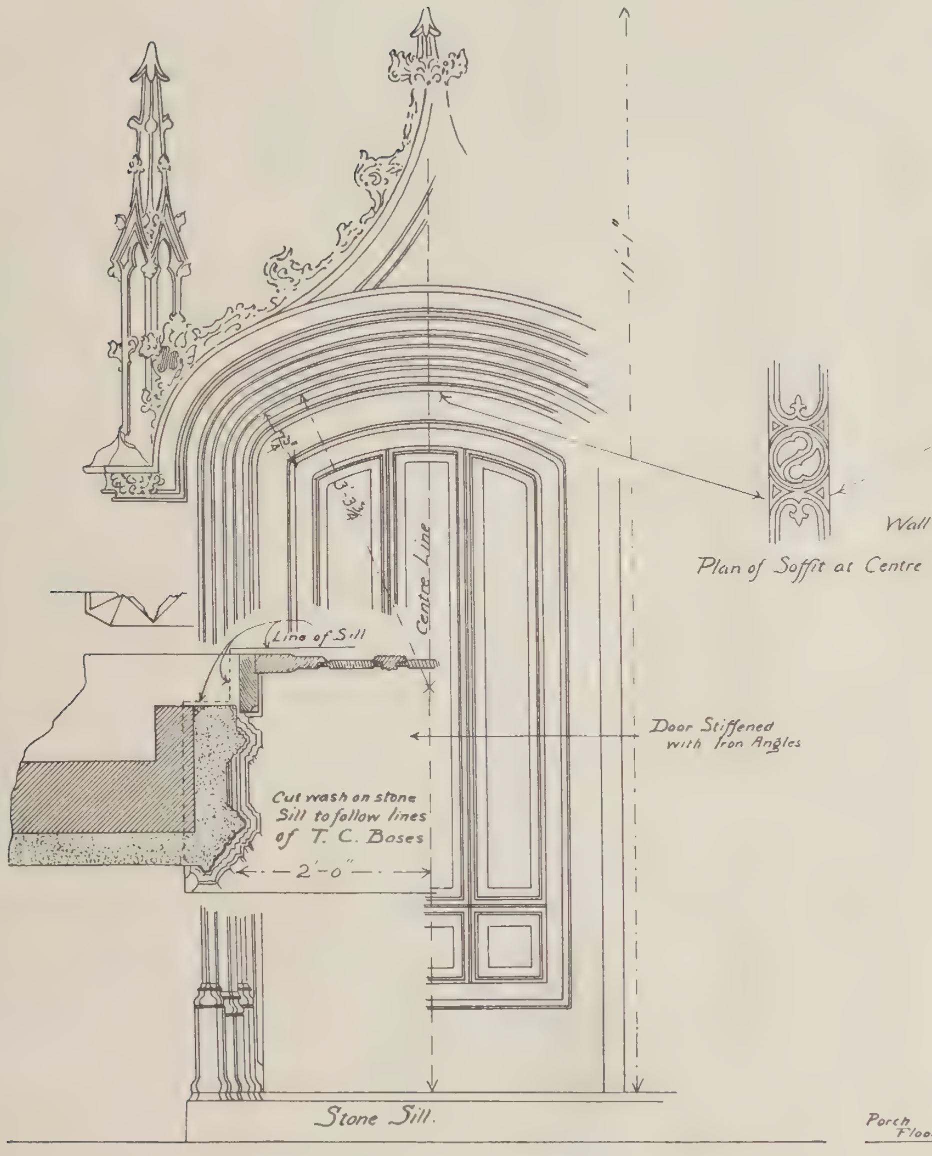
As regards the construction of this terra-cotta house, nothing could be more simple. The terra-cotta was made in the form of four-inch ashlar, and built up just ahead of an eight-inch brick backing to which it was firmly bonded by means simply of occasional brick projecting into the cellular backs of the ashlar. Each projecting brick was bedded in a corner of a cell, so that one side and one edge of each brick has a mortar bearing. With the exception of these bond brick, the hollow terra-cotta remained without filling, thus gaining all the advantage of a hollow wall. The plain blocks were made in sizes averaging seven inches and ten and a half inches in height, of alternate courses respectively, by about eighteen inches in length. A rule is to make the vertical dimension a multiple of two and a half inches, so that it will suit the ordinary brick backing. It is considered best to keep the greatest blocks within the dimensions of a two-foot cube, although the veranda column shafts were nicely made in single pieces (the shells being one and a half inches thick), and often still larger pieces are made, without too perceptible shrinkage and warping.



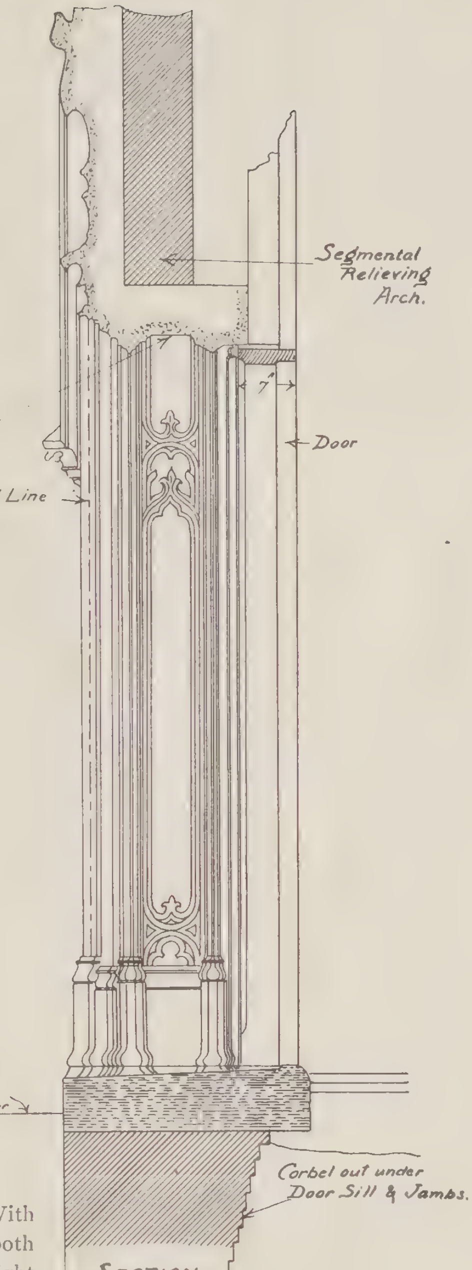
By permission of *The Clayworker.*

VIEW OF PORCH, RESIDENCE OF W. D. GATES, HILLSDALE, ILL. (See detail on Plate 25.)

MESSRS. JENNEY & MUNDIE, ARCHITECTS, CHICAGO.


11'-1"
3'-3½"
Centre Line
Line of Sill
2'-2"
Cut wash on stone Sill to follow lines of T. C. Bases
2'-0"
Door Stiffened with Iron Angles
Plan of Soffit at Centre
Stone Sill

PLAN & ELEVATION OF MAIN ENTRANCE DOOR


Segmental Relieving Arch.
7"
Door
Wall Line
Porch Floor
Corbel out under Door Sill & Jambs.

SECTION

For special cases of construction, where rolled beams or cast lintels were desirable, nothing could be adapted so easily as terra-cotta. For example, see the head of a second-story window, a section of which is shown in Fig. 1 (Plate 27). Where an arched head was allowable, the terra-cotta as well as the brick backing, each easily carried itself, — see third-story window in Fig. 1. The arches of the front veranda, where there is little superimposed weight, carry themselves; care being taken, of course, to counteract thrusts by means of suitable ties. Wood scantling were thrust down into the shafts of the corner columns (iron angles would have been better), which, acting as vertical beams, required no horizontal tie below the crown of the arches; the wood plate under the rafters being the only tie. The vertical tie rods, shown in Fig. 5 (Plate 27), were omitted. The veranda rafters were well bolted to the main walls. The veranda columns, arches, and balustrade is a nice piece of work. The balustrade required special care, as it is open work and finished both inside and outside. In the case of the rear porch or loggia (Fig. 6, Plate 27), where a heavy load had to be carried over the arch, steel beams could be used sunk into the voussoirs in a way quite impracticable with any other material than terra-cotta.

In deciding on the color of terra-cotta for his house, Mr. Gates tried a bold experiment with spotted or mottled surface. Spots of black, brown, and white were scattered thickly over a warm buff ground, giving a raindrop effect. All of the terra-cotta was treated in this way before going into the kiln. The general effect is surprisingly successful. Mr. Gates considers that this mottled effect and a combed or otherwise roughened surface are two important considerations for plain ashlar work. With a plain tint on a smooth surface, the play of light reveals the slightest warping from a perfect plane and unpleasantly shows every inaccuracy of the joints. These objections, which might obtain in work on a fine residence to be viewed close to the eye, were entirely obviated by the above expedients.

Terra-cotta can be made in colors of a wide range (one contractor has a sample list of two hundred shades), from almost pure white through the yellows, grays, browns, to dark red; it is strong and yet light in weight; it can be bolted and anchored with ease; it can receive a semi-glaze which will keep out moisture without injuring its appearance; in short, terra-cotta is so "ductile," as some one has said, and it is so easily moulded to suit the designers' ideas in any style, that there is surely a pleasant future for it in residence work. The architect can visit the artistic modeller in the factory, criticise and change any of the ornament, and even have the individuality of his own thumb-nail appear in the surface of the finished building. It is to be hoped that the artistic standard of terra-cotta work may be put upon a high plane; that improved processes and constant cheapening will come rather in fire-clay floor arches, and partitions, so that fireproof dwellings may become more common; that the sleeping family may be as safe at home as the insurance policy in the incombustible office building; and that then "burned earth" may be a thing of use, a thing of beauty, and a joy for a lifetime.

CHICAGO, April 11, 1894. D. EVERETT WAID.

THE ART OF BUILDING AMONG THE ROMANS.*

Translated from the French of Aguste Choisy by

ARTHUR J. DILLON.

INTRODUCTION.

THE edifices of antiquity have been often described from an architectural point of view, but the details of their construction are still but vaguely known. When during the first years of the fifteenth century architects reinstated in honor the ruins of these long-forgotten monuments, they thought first of all to create a new art by imitating classic models. In accordance with this idea they chiefly observed the forms, the proportions, and the ornaments which they wished to revive by new applications; and the impulse given by them to archæological research is felt up to the present time: their pupils, following the way opened to them, have turned over the soil of Italy and of Greece to continue the work of restoration thus begun. During three entire centuries discoveries have multiplied with extreme rapidity, but the spirit of investigation was not sensibly changed; it stopped at the surface of the monuments, without studying the skeleton, and the progress consisted principally in a better appreciation and a better knowledge of the exterior beauties of antique architecture.

To-day the results of so much labor are almost completely classified; the scattered fragments have resumed their places, and without great effort we can picture to ourselves the monuments of Rome and Athens in all the splendor of their primitive decoration. To complete the undertaking of our forerunners, it remains to make known the structure of the edifices of which they so learnedly interpreted the forms. Without doubt their writings throw some light on the means of construction; but the indications they offer in this regard are ordinarily very summary. They are given nearly always incidentally as isolated facts, as simple remarks connected by no theory. These general glimpses suffice to arouse our curiosity, but are far from satisfying it; they rather make us understand the utility of a special study in which the practical rules which were observed in antiquity would be collected and explained with more exactitude and development.

Such a review of abandoned methods would offer more than that undefined interest which is attached to the beginnings of all human industry. The construction, such as it is shown by the scattered details in descriptions of ruins, seems as ingenious as it is strong; it sums up a long and laborious experience consecrated by monuments which have undergone the test of centuries; it permits us to appreciate the extent and the nature of the resources made use of by the ancients, the development the applied sciences had attained in their day; in a word, the circumstances of antique construction form part of the social history of the peoples who have preceded us, and in more than one respect the questions they raise merit from us serious attention.

In the treatise which follows, I will touch on some of these questions, insisting especially on those which have relation to Roman art. With the Greeks the analysis of construction would be so involved with that of the architecture that it would be difficult to separate them so as to examine them apart; but the difficulty ceases when one examines the monuments raised under the domination of Rome. Their authors troubled themselves little enough about refinements of form; the arrangement of plans, the choice of methods of executions, was better suited to the entirely practical turn of their minds. As if they felt themselves incapable of embracing, as did the Greeks, architecture in its entirety, and following out together the various operations it comprises, they established a well-defined difference between structure, in which they were masters, and decoration, for which they affected a disdainful indifference. They left to others the task of ornamenting their edifices, charging themselves with the arrangement and building of them, two problems which they made their own, treating them in a manner truly Roman. The way they imprinted, in the extent of their vast works, the traces of their character, needs, and customs has often been remarked; what they did in the art of building is less known; but here also one must expect to meet the stamp of their organizing genius, and the use of processes without precedent in accordance with the exceptional nature of their resources.

In fact, the vestiges of construction which date back to good epochs of Roman art show arrangements which it would be hard to find even indicated in monuments of another period; it suffices to observe one of those vaults which denote by their presence the points to which Roman empire extended, to be struck with the series of details which establish between ancient methods and our own such profound differences. These are on every hand: arches built in the thickness of the masonry; chains of supports of unusual forms; strengthenings of divers sorts, formerly hidden in the middle of stone work or veiled by plaster, which the decay of the edifices reveals to us by portions often disfigured or incomplete. What functions did these curious ruins fill? Of what use were these big, roughly constructed arches swallowed up in the masses of the vaults, these skeletons of brickwork which often checker the surfaces? By what rules and with what object were these members of this plastered framework combined in the body of the masonry, always light, put up with little trouble, hastily, and without precision? Nothing in our own construction corresponds to these auxiliary works; and nevertheless, judging their importance by the universality of their employment, they seem to have played a capital part in the economy of Roman building. Without doubt they were not there for ornament; they were too irregular and put up with a too evident haste for one to have thought of leaving them apparent; they constituted a kind of interior framework for the building where practical ideas were manifested the most freely and the most sincerely because there were no exigencies of architecture to complicate or hinder their expression. Thus the rules of the art of building are written, so to speak, in these singular works; and if one had to choose certain details to characterize the Roman's methods of construction, no partial study of their edifices would be better suited to this object than that of the ribs with which they braced their vaults.

These ideas struck me forcibly the day I found myself for the first time in the presence of the ruins of ancient Rome, and they have served as a point of departure for my researches among ancient monuments. It seems to me that the history of these monuments, regarded from the point of view of an engineer, could easily be written and set forth without confusion, if to establish a system in the work one profited by the close connection which in general joins the details of Roman construction to the principles which govern the building of vaults. Especially placing myself at this point of view, and, moreover, guided and sustained by the counsels and good wishes of a master who united to the science of an engineer the talents of an architect, I endeavored in a series of voyages which the *administration des ponts et chaussées* kindly encouraged, or prescribed, to gather together the principal documents likely to throw light on the technical questions which relate to the monuments of Roman art. It is the results of this research which I publish to-day. Without undertaking to reconstruct in all its parts a lost system of construction, I shall try at least to describe various details at present too imperfectly comprehended, to give an account of processes of which the significance has seemed clear to me, and to simply call attention to those whose meaning I have not fully grasped.

To tell the truth, I have thought less of writing a history of construction among the ancients than of furnishing the documents for such a work; and I had before all to be on my guard, in a case where observation is so often so delicate a matter, against documents of doubtful origin and capable of misleading a critic. Therefore I have imposed on myself the express condition of citing no examples without having personally established their exactitude or without clearly indicating the sources from which I have drawn them. Sometimes it has been necessary to complete my observations by hypotheses, but in no case have I done this without making the point where observation ceases and hypothesis begins very clear.

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* *See advertising page ix.*

As to theoretic explanations, I should have liked to have surrounded them with the same guarantees, confining myself to advancing only those confirmed by ancient writings; but this verification has not always been possible and the writer on whom I counted most to guide me has too often failed me. Vitruvius speaks of vaults only incidentally, in a vague manner, and with a brevity which is but little in accord with the importance of the subject. It is, in fact, because at his time vaulted construction had by no means reached the development it afterwards attained; no vault of very great span and built on the system of rubble masonry, which later was so widespread, can with certainty be attributed to an epoch anterior to that of Vitruvius; the author of the only ancient treatise on construction remaining to us assisted only toward the end of his life at those colossal enterprises which recall to us the names of Augustus and Agrippa, and which marked the beginning of a new era in Roman architecture; he himself had no part in the magnificent impulse which produced the Baths of Agrippa and the Pantheon of Rome, and his book, the work of his old age, offers us less a picture of the innovations of a contemporary epoch than a souvenir of the procedure in use during the last days of the Republic, — a sort of return toward the methods he had applied in the course of his long career.

Vitruvius excepted, the ancient writers do not treat construction with enough detail for one to have reason to expect from them anything really useful. Pliny, given above all to speculative observations, develops less the methods followed in the use of materials than the natural history of the materials themselves. Frontinus regards construction more as a director of works than as an architect; and though he may often mention vaulted works built under his direction, he nowhere enters into the details of the process. There still remain, perhaps, writings on Roman agriculture or on military arts, in which are found short descriptions relative to building; but the constructions mentioned have too special an object, and the writings, which treat of them briefly, can only throw a doubtful light on the general principles of practical architecture. Moreover, the rare allusions which they make to ordinary methods are very obscure, and many would remain, I think, unintelligible, if the ruins were not there to serve as commentaries.

The almost absolute silence of writers forced me to explain theoretically the facts I have observed; but the explanatory hypotheses have fortunately shown characteristics of great truth, and the perfect clearness which the ancients have shown in all their applications of the art of building fills out, to a certain extent, the blanks in the treatises they have left us. Strictly economical calculations were to me manifestly evident as the principal cause of the various characteristics of ancient construction, and in spite of the very natural distrust with which I was inspired by such an hypothesis applied to the monuments of the great Roman power, it constantly forced itself on me at the end of my studies as the inevitable conclusion to which I must come in spite of myself.

Thenceforth I perceived that one accustoms himself too easily to look upon the Romans as a people who, disposing of immense riches, had never to consider material means, and who could disdain without a scruple the expedients which are sometimes suggested to us by the insufficiency of our resources. The passion for large things assuredly was not a stranger to their enterprises, but the genius of the Romans knew how to reconcile the vastness of projects with a facility of execution. The more closely I examined their monuments, the more it seemed to me impossible not to recognize the employment of a thousand artifices, having for their object, if not the reduction of skilled labor, at least a simplification of it. While architects have aimed in their conceptions of the ensemble at a majesty of effect and an endurance worthy of the power and eternity of the Roman people, an evident eye to rigorous saving guided them in the execution of every part; they always aspired to achieve by the use of processes, as easy as they were simple, the double merit of perfect solidity and incomparable grandeur.

This observation led me to look at Roman construction as having a practical aspect I did not at first suspect; as the Romans sought economy in their edifices perhaps we might gain something in reviving some of their processes. Every day we borrow from the ancients forms of decoration; apparently they have something to teach us in the art of building as well, and the history of their edifices more completely known may interest the future of the art of construction as well as that of architecture. This conjecture seems incontestable, but it is not absolute, and to appreciate the importance and degree of fidelity which in these days would be allowable in the imitation of ancient processes one should take account of the differences made by the interval of fifteen centuries between the Roman resources and our own. I shall not speak here of the slaves the Romans so frequently employed in building; they had, especially in the provinces, a resource still greater and more ordinary, which was to use on the public buildings that part of the population of the empire subject to public labor. They thus recruited in corvées as many laborers as they wished to employ. But these improvised workmen, torn from their habitual occupations and dragged by force to the works, were generally found very ill prepared for their new rôle. The Romans did not hesitate to put them to any fatigue whatever, but they were obliged to apportion the difficulties of their tasks according to their inexperience; it was necessary to demand from them purely physical efforts only, and to reduce as far as possible the part left to their intelligence and dexterity. Thanks to the progress of civilization, such resources and the methods which facilitated their employment are now forbidden us.

Moreover, the methods employed by the Romans have not all this exceptional character; they do not all present such close correlation with a social system which ceased long ago to weigh upon the world, and besides these methods of execution, the study of which henceforward belongs exclusively to history, we find among the Romans quite a number of artifices of less special character which may be employed in our own time as they were at the time of the Cæsars. Such are the expedients which the ancients invented, as we shall see, to reduce the importance of the auxiliary works; centrings, for example, or scaffoldings, and, in general, those expensive accessories which hamper the progress of the work and increase its price. The adoption of any complex processes or roundabout ways was repugnant to the Roman mind. Physical labor cost them little, and nowhere in the durable parts of their buildings have they been saving of it, but nowhere have they expended it for temporary work without regret. The rule which they followed was, on the contrary, to utilize for permanent work, and in the simplest way, all the resources drawn on for the construction of their edifices; this very elementary rule will account for the greater part of the artifices peculiar to Roman art which we are to show.

So, independent of the methods whose employment we cannot renew without placing ourselves in formal opposition to the economic system of our times, we meet in the old traditions of the art of building with processes whose merit does not result exclusively from their appropriateness to the people who used them, but whose generality permits them to be applied to new uses. Still the general principles followed by the Romans are very few in number; the reapplication of the resultant processes will always be subjected to certain restrictions, and to use them for our purposes it will often be necessary to modify them more or less profoundly. But even if imitation should be forbidden us, these processes are well worth studying. One who applied himself exclusively to their form would have but an imperfect knowledge of the monuments of antiquity, and a description of these monuments, from the point of view of construction, will aid at least in filling up some of the gaps in the history of a justly celebrated architecture. (*To be continued.*)

THE principal object of our greatly reduced club rates, which are given on page ii, is to enable draughtsmen and students, by sending their subscriptions through some one of their number, to get the paper at a very low price. We therefore request architects to call the attention of their draughtsmen to our club rates.

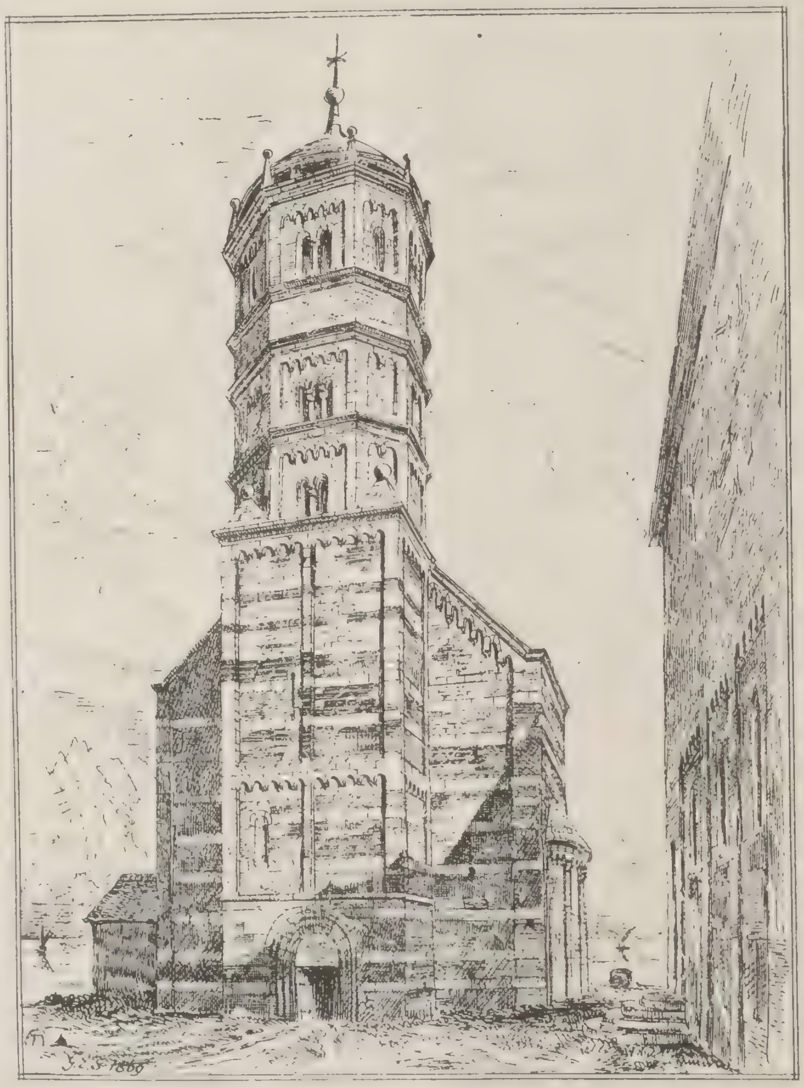
BRICK AND MARBLE IN THE MIDDLE AGES.

(*Continued.*)

CHAPTER IV.

> "But now 'tis pass'd,
> That turbulent chaos; and the promised land
> Lies at my feet in all its loveliness!
> To him who starts up from a terrible dream,
> And lo, the sun is shining and the lark
> Singing aloud for joy, to him is not
> Such sudden ravishment as now I feel,
> At the first glimpses of fair Italy."
>
> —*Rogers.*

CHIAVENNA — LAKE OF RIVA — COLICO — GRAVIDONA — LAKE OF COMO — VARENNA — STELVIO PASS — LECCO — BERGAMO — BROLETTO — CHURCHES — CASTLE OF MALPAGA.



BAPTISTERY, GRAVIDONA.

THE situation of Chiavenna is eminently beautiful: in a deep valley surrounded on all sides by mountains whose slopes are covered with soft and luxuriant foliage of oak and chestnut, and where every available open space is devoted to trellised vineyards, it contrasts strongly with the pine-covered hills so lately passed on the northern slopes of the Alps; placed, too, at the confluence of two streams, — the Meira and the Lira, — it rejoices in the constant, rushing sound of many waters.

It was only necessary to move out of the shade of our hotel into the melancholy piazza in which it stands, to discover that an Italian sun lighted up the deep-blue sky; and a walk to the principal church, dedicated in honor of St. Lawrence, a stroll through the narrow streets, and a rather toilsome ascent through a vineyard formed upon a rock which towers up behind a kind of ruined castle, and from which a capital view is obtained of the singular and beautiful *cul-de-sac* in which the town is planted, sufficiently convinced us of its power.

The church of St. Lawrence is entered from a large, oblong cloister, in one angle of the space, enclosed by which rises a tall campanile, its simple form, and its arcaded belfry full of musical bells, contrasting well with the outline of the hills, which overhang and hem it in. On the east side of the cloister are the church, an octagonal baptistery, and a bone-house, all ranged side by side, and opening into it, and the latter curious as an example of the extent to which the people of Chiavenna amuse themselves by arranging skulls and arm bones into all kinds of religious and heraldic devices, and with labels to mark the names of their former owners. The *tout ensemble* is picturesque in its effect, and the cool, pleasant shade of the cloister, with the view of the church and its tall campanile, and irregularly grouped buildings looking brilliantly white in the clear sunshine, was very pleasing.*

Italian beggars, persevering, and, at any rate in appearance, very devout, did their best to annoy us here and everywhere when we ventured to stop to examine or admire anything; and Italian beggars are certainly both in pertinacity and in filth about the most unpleasant of their class.

My voiturier gave me a lesson worth learning, and not perhaps unworthy of note for other unsuspicious travellers. We had a written contract to Chiavenna, and thence to Colico he had agreed verbally to take us for a certain sum; before we started I found, however, that he intended to charge us three times as much as we had agreed upon, and as very luckily we found a diligence on the point of starting, we secured places in the cabriolet at its back, from which we had the best possible position for seeing the views, and so left him in the lurch, with divers admonitions to behave himself more honestly for the future.

At ten we left, and had a very enjoyable ride to Colico. The valley, however, bore sad traces of the havoc made by the inundations of the Meira, and of the storm of the previous night. We soon reached the shores of the little Lake of Riva, along whose banks our road took us sometimes in tunnels, sometimes on causeways built out into the water, until at last we reached the valley up which runs the Stelvio road, and then, after passing along the whole length of a straight road lined on each side with a wearisome and endless row of poplars, we were at Colico. Here we prudently availed ourselves of the opportunity of an hour's delay in the departure of the boat for an early dinner, and, then embarking, waited patiently the pleasure of our captain.

The scenery of Lake Como has been so often extravagantly praised that I was quite prepared to be disappointed: but for the whole distance from Colico to Lecco it is certainly on the whole more striking than any lake scenery I have seen. The mountains at its head are extremely irregular and picturesque, and throughout its whole length there is great change and variety. In this respect it contrasts favorably with most other lakes, and I certainly think that not even in the Lake of Lucerne is there any one view so grand as that which one has looking up from within a short distance of the head of Como over the Lake of Riva to the mountains closing in the Stelvio, and rising nobly above the sources of the Meira and the Lira.

Somewhat, too, may be said of the innumerable villages and white villas with which the banks of the lake are studded; they give a sunny, inhabited, and cheerful feeling to the whole scene, and, reflected in the deep-blue lake, in those long-drawn lines of flaky white, which are seen in no other water to such perfection, add certainly some beauty to the general view.

One of these villages, Gravidona, within half an hour's sail of Colico, ought not to be left unvisited by any one who cares about architecture.

Close to its little harbor stand two churches, side by side, one an oblong basilica, the other a baptistery of, as it seems to me, such great interest that I give illustrations both of its plan and of its exterior. It will be seen that the dimensions are small, the total internal width being less than forty feet, whilst the design of the east end is most ingeniously contrived so as to give no less than five eastern apsidal recesses. There are two stair turrets in the wall, on each side of the western tower, which lead up to a sort of triforium passage, which is formed behind an arcade in the side wall of the church, and one of them leads also to the first floor of the tower. The triforium consists of an arcade of seven arches in each side of the wall. The three small apses at the east have each their own semi-dome, and the chancel, as well as all the other apsidal recesses, are similarly roofed. All the walls retain more or less traces of old paintings, the Coronation of the Blessed Virgin occupying the principal apse, and the Last Judgment the west wall. The whole church is built in white marble and black limestone, used in courses, or stripes, with extremely good effect.

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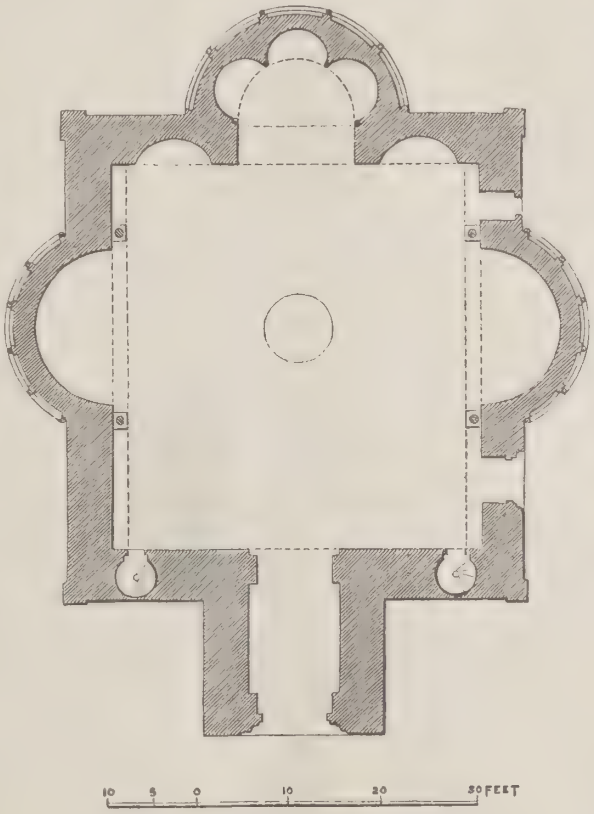
* Probably most travellers who pass by Chiavenna are now on their way to or from the Engadin, by the beautiful Maloja Pass. They will do well before they reach the top of the Pass to notice on their left the ruined remains of a Gothic chapel of the fifteenth century, which may, I suppose, aspire to the honor of being at a greater height above the sea than any other Gothic church in Europe. Its architectural merit is not great, but still it has a certain value, as showing how well a simple little Gothic church looks among the wildest mountain scenery.

The roof of this baptistery is of wood. The exterior is best explained by reference to my drawing of the west front. It stands on a charming site, with a background of lake and mountain, such as one seldom enjoys. There is a contrast here, which strikes one very much, between the ingenious skill of the planning of such a building as this and the rudeness of the execution of the details. I know nothing as to the history of Gravidona; but it looks as though the plan came from the hands of men who knew something of the church of San Vitale at Ravenna, whilst its execution was left to the rustic skill of the masons of the country.



PLAN — BAPTISTERY, GRAVIDONA.

The baptistery is dedicated to St. John the Baptist. Close to it, as I have said, stands the church of San Vincenzo, which, though Romanesque in its foundation, has been much modernized, and is now mainly interesting on account of the exquisite examples of late fifteenth century silversmiths' work which still enrich its sacristy. Conspicuous among these is a silver processional cross. This cross is nearly two feet across the arms by three feet in height from the top of the staff. There is a crucifix on one side and a sitting figure of Our Lord on the other, figures of SS. George, Vincent, Sebastian, Christopher, and Victor, and Our Lord on the base or knop, and half-figures of the Evangelists on the arms of the cross. The ornaments consist of crockets bent and twisted, of blue enamels, filigree work, nielli, and turquoises set in the centre of dark-blue enamels. It is, in short, a piece of metal work which might well make a modern silversmith run down swiftly into the lake and drown himself in despair at the apparent impossibility in these days of rivalling such a piece of artistic and cunning workmanship, in spite of all our boasted progress!

Not much less splendid is a chalice of about the same age. It is ten and three-quarter inches high, has a plain bowl, but knop, stem, and foot all most richly wrought with figures, niches, and canopies, and the flat surfaces filled with fine blue and white Limoges enamels. The paten belonging to this chalice is very large, nearly ten inches across, and quite plain.

Half the passengers on the steamboat were, of course, Austrian soldiers and officers, the other half English or Americans, either resident at or going to Como. We, however, stopped on the way, and, leaving the steamboat in the middle of the lake, after a row of about twenty minutes found ourselves at Varenna, a village exquisitely placed just where the three arms of the lake — the Como, the Lecco, and the Colico branches — separate, affording, whether seen from here, from Bellagio, or from Cadenabbia, the most lovely lake views it has ever been my good fortune to see.

Here we had what seemed likely to be an endless discussion upon the relative merits of a four-oared boat and a carriage as a means of conveyance to Lecco. We inclined to the latter; but, leaving the matter in the hands of an active waiter, we busied ourselves with eating delicious fruit, admiring the tall cypresses growing everywhere about the shores of the lake, and watching the exquisite beauty of the reflections of Bellagio and the opposite mountains on the smooth bosom of the water.

We were soon off again, and well satisfied to find ourselves trotting rapidly along the well-kept Stelvio road, instead of dragging heavily and slowly along, as one always does, with a Swiss voiturier; soon, however, we were to find that our driver was an exception to the Italian rule, and that he who wishes to travel fast must not expect to do so with vetturini.

The churches which we passed were in no way remarkable; they all had campanili, with the bells hung in the Italian fashion in the belfry windows, with their wheels projecting far beyond the line of the wall; but they all seemed alike, uninteresting in their architecture, so that we were in no way sorry to pass them rapidly on our way to Lecco. This eastern arm of the lake, though of course much less travelled than the rest of its course, is very beautiful, and its uninhabited and less cultivated looking shores, with bold cliffs here and there rising precipitously from the water, were seen to great advantage, with the calm, unrippled surface of the lake below, and the sky just tinged with the bright light of the sun before it set above.

Lecco contains nothing to interest a traveller; we had an hour to spend there before we could get fresh horses to take us on to Bergamo, and wandered about the quaint-looking streets, which were full of people — some idly enjoying themselves, others selling luscious-looking fruit. We went into a large church not yet quite completed; it was Renaissance in style, almost of course, and on the old plan, with aisles, but very ugly notwithstanding. In the nave was a coffin, covered with a pall of black and gold; six large candles stood by it, three on either side, and two larger than the others on each side of a crucifix, at the west end. The whole church revelled in compo, inside and out, and there was external access to a wretched bone-house in a crypt.

Leaving Lecco, we had a long drive in the dark to Bergamo; the night was very dark, but the air was absolutely teeming with life, and sounds of life; myriads of *cicale* seemed to surround us, each giving vent to its pleasure in its own particular note and voice, with the greatest possible determination; and had I not heard them, I could scarcely have believed it possible that such sounds could be made by insects, however numerous they might be. We changed horses at a village on the road, and went on rapidly. The old town of Ponte San Pietro was passed, having been taken at first to be Bergamo, and remembered by the sound of a troop of men singing well together as they passed us in the dark in one of its narrow streets, awakening with their voices all the echoes of the place, which, till then, had seemed to us to be supernaturally silent. It was eleven o'clock before we reached Bergamo, and, tired with our long day's work, we were soon in bed.

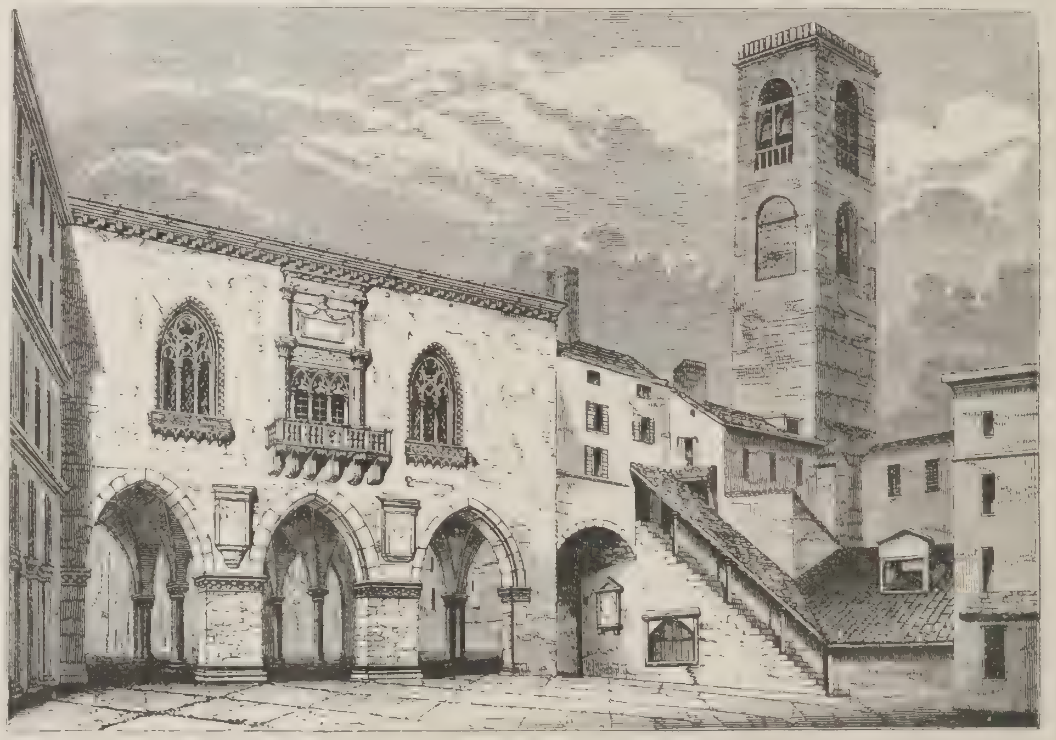
A prodigious noise in the streets before five o'clock the next morning gave us the first warning that the great fair of Bergamo was in full swing; sleep was impossible, and so we were soon out, enjoying the busy throng which crowded the streets of the Borgo, in a before-breakfast walk; the crowd of women selling fruit, the bright colors of their dresses, the rich tints of stuff hung out for sale, the display of hairpins and other ornaments in the innumerable silversmiths' shops, and the noisy, laughing, talking people who animated the whole scene, made the narrow arcaded streets of the busy place most amusing.

After breakfast we started at once for the Città, as the old city of Bergamo is called. It stands on a lofty hill overlooking the Borgo San Leonardo, within whose precincts we had slept, quite distinct from it and enclosed within its own walls. The ascent was both steep and hot, but the view at the entrance gateway of the Città over the flat Lombard country was very striking, and well repaid the labor of the ascent. This vast plain of bluish-green color, intersected in all directions by rows of mulberry-trees and poplars, diversified only by the tall white lines of the campanili which mark every village in this part of Lombardy, and stretching away in the same endless level as far as the eye could reach, was grand, if only on account of its simplicity, and had for us all the charm of novelty.

Through narrow and rather dirty streets, which do little credit to the cleanly habits of the Bergamask nobility, to whom it seems that the Città is sacred, and whose palaces are, many of them, large and important buildings, we reached at last the Piazza Vecchia, around which is gathered almost all that in my eyes gives interest to Bergamo.

Across the upper end of the Piazza stretches the Broletto, or town hall, supported on open arches, through which pleasant glimpses are obtained of the cathedral and church of Sta. Maria Maggiore, which last is the great architectural feature of the city.

But we must examine the Broletto before we go farther. And first of all, its very position teaches a lesson. Forming on one side the boundary of a spacious piazza, on the other it faces, within a few feet only, the church of Sta. Maria Maggiore, and abuts at one end upon the west front of the Duomo. It is to this singularly close — even huddled — grouping that much of the exquisite beauty of the whole is owing. No doubt Sta. Maria and the original cathedral were built first, and then the architect of the Broletto, not fearing — as one would fear now — to damage what has been done before, boldly throws his work across in front of them, but upon lofty open arches, through which glimpses just obtained of the beauties in store beyond make the gazer even more delighted with the churches when he reaches them than he would have been had they been all seen from the first. It is, in fact, a notable example of the difference between ancient grouping and modern, and one instance only, out of hundreds that might be adduced from our own country and from the Continent, of the principle upon which old architects worked; and yet, people, ignorant of real principles in art, talk as though somewhat would be gained if we could pull down St. Margaret's, in order to let Westminster Abbey be seen; whereas, in truth, the certain result would be, in the first place, a great loss of scale in the Abbey seen without another building to compare it with and measure it by; and in the next, the loss of that kind of intricacy and mystery, which is one of the chief evidences of the Gothic spirit. Let us learn from such examples as this at Bergamo that buildings do not always require a large open space in front of them, so that they may be all seen and taken in at one view, in order to give them real dignity.



BROLETTO, BERGAMO.

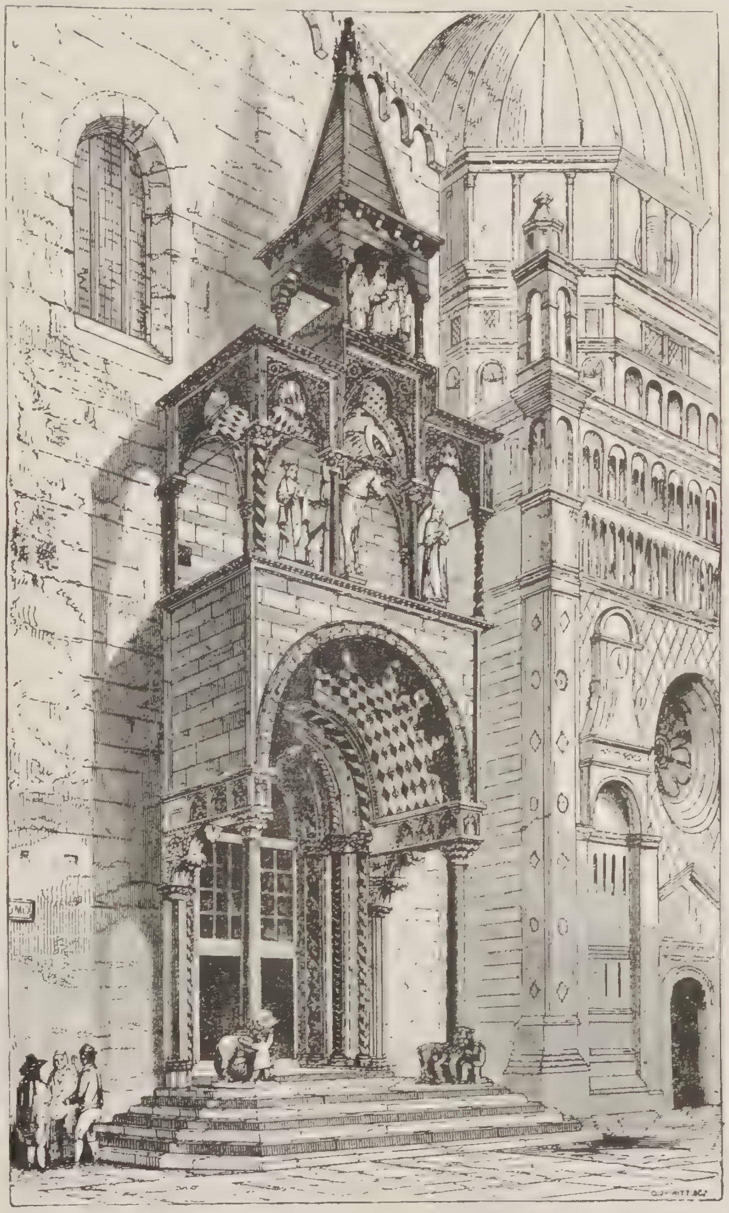
The whole design of the Broletto is so very simple as to be almost chargeable with rudeness of character. The ground on which it stands is divided by columns and piers, the spaces between them being all arched and groined. Towards the Piazza three of these arches, springing from rather wide piers, support the main building, and another supports an additional building to the west of it. Above the three main arches are three windows of which that in the centre, though very much altered, still retains a partially old balcony in front, and was evidently the Ringhiera, from which the people standing in the Piazza were wont to be addressed by their magistrates. The windows on either side are very similar in their design and detail; their tracery is of fair middle-pointed character; and the main points in which they strike one as being different from English work are the marble shafts with square capitals in place of monials, a certain degree of squareness and flatness in the mouldings, and the very pronounced effect of the sills, which have a course of foliage and moulding, and below this of trefoiled arcaded ornament, which in one shape or another is to meet the traveller everywhere in Northern Italy; either, as here, hanging on under the sills of windows, or else running up the sides of gables, forming string-courses and cornices, but always unsatisfactory, because unmeaning and unconstructional. The origin of this sort of detail is to be found in the numerous brick buildings not far distant, where the facility of repeating the patterns of moulded bricks led (as it did in other countries also) to this rather unsatisfactory kind of enrichment. The detail of the arcades supporting the upper part of the building is throughout bold and simple, and I should say of the thirteenth century; the bases are quite Northern in their section, the caps rather less deep in their cutting, but still in their general design, and in the grouping of tufts of drooping foliage regularly one above the other, reminding one much of Early French work, though they are certainly not nearly so good as that generally is. There is a flatness about the carving, too, which gives the impression of a struggle, in the hand of the carver, between the Classic and Gothic principles, in which the latter never quite asserted the mastery. The lesson to be learnt from such a building as this Broletto appears to me to be the excessive value of simplicity and regularity of parts carefully and constructionally treated; for there are no breaks or buttresses in the design, and all its elements are most simple, yet nevertheless the result is beautiful.

To the west of the Broletto is a good open staircase (much like that in the Piazza dei Signori at Verona), forming a portion of one side of the Piazza, and leading to the upper part of the buildings, and, I think, to the great clock-tower, which, gaunt and severe in its outline, undecorated and apparently uncared for, rears its great height of rough stone wall boldly against the sky, and groups picturesquely with the irregular buildings around it. I have omitted to notice that the whole of the Broletto, with the exception of the window shafts, is executed in stone, and without any introduction of colored material, so that it in no way competes with the exquisite piece of colored construction which we have next to examine, immediately behind it.

A few steps will take us under the open-arched and cool space beneath the Broletto, to the face of the north porch and baptistery of Sta. Maria Maggiore. This is a very fine early Romanesque* church, but with many additions and alterations on the outside, and so much modernized inside as to be quite uninteresting to any one who thinks good forms and good details necessary to good effect. The plan is cruciform, with apses to the choir, on the east and west sides of the south transept, on the east of the north transept, and at the west end of an additional north aisle; in all no less than five apsidal ends. The nave is of three bays with aisles, and to each transept have been added, in the fourteenth century, porches, thoroughly Italian in their whole idea, and novel to a degree in their effect upon an English eye.

A domed chapel, erected as a sepulchral chapel by Bartolomeo Colleoni in the Renaissance style, on the north side of the nave, is most elaborately constructed of colored marbles. The effect is too bizarre to be good; there is an entire absence of any true style in its design; and there is nothing which makes it necessary to criticise it with much minuteness.

The best and most striking feature in the whole church is the north porch, a most elaborate structure of red, gray, and white marble, to which a drawing without color can hardly do justice. It is supported upon detached marble shafts, whose bases rest upon the backs of rather grand-looking lions, curiously grouped with children and cubs. Above the arches which rest upon these shafts, and which, though circular, are elaborately cusped, is another stage divided by columns and trefoiled arches into three spaces, the centre of which is occupied by a noble figure of a certain Duke Lupus on horseback, with a saint on either side in the other divisions. All the shafts except those in the upper division are of red marble; the highest stage of all is entirely of gray marble; in the middle stage all the moulded parts are of red, and the trefoiled arches and their spandrels of gray marble; the space at the back of the open divisions and the wall over the main arches of the porch are built in courses of red and white marble. All the groining is divided into diamond-shaped panels, composed alternately of black, red, and white marble, all carved in the same kind of pattern. In the great arch of the porch the outer moulding is of red marble, and all the cusping of gray. The construction of the whole is obviously very weak, and depends altogether for its stability upon iron ties in every direction.


NORTH PORCH, STA. MARIA MAGGIORE, BERGAMO.

The approach to the porch, by seven steps formed alternately of black and white marble, increases the impressiveness of the grand doorway, in front of which it is built, the whole of which is of white marble, whose carved surfaces and richly moulded and traceried work have obtained a soft yellow color by their exposure to the changing atmosphere, and are relieved by one — the central — shaft being executed in the purest red marble. There are three shafts in each jamb, carved, twisted, or moulded very beautifully. These shafts are set in square recesses, ornamented, not with mouldings but with elaborate flat carvings, in one place of saints, in another of animals, and with foliage very flat in its character, and mainly founded on the acanthus.

To an English eye these columns in the doorways are some of the most charming features of Italian architecture; but they must be always looked at as simply ornamental, and not as constructional features; and perhaps in all doorways the shafts, being really incapable of supporting any considerable weight, would be better if, by their twisting and moulding, it were clearly shown that their architect meant them to be simply ornamental. In the Bergamo doorway the spaces between the shafts are so strong in their effect, though carved all over their surface, that any lightness in the columns themselves is amply atoned for. Such a work as this northern porch at Bergamo is indeed a great treat to an English architect, teeming as it does with fresh and new ideas, and in a small compass showing so many of the radical points of difference between Northern and Southern Gothic, and at the same time offering so beautiful a study of constructional coloring, that it is impossible to tire of gazing at it.

The porch to the south transept is of a simpler but somewhat similar design. Both are placed against the western half of the gable against which they are built, with a pleasant ignorance of those new-fangled views of regularity of plan which are the curse of modern architects. This southern porch is round-arched, and fitted exactly to the doorway which it shields. Its outer arch is carried on detached shafts resting on the backs of monsters, and it is mainly constructed of black and white marble. It is of only one stage in height, and has a deep cornice enriched with a series of niches with figures. An inscription below the cornice gives the date as 1360.* Above the porch, but independent of it, is a lofty monumental pinnacle corbelled out from the wall, and richly sculptured with crocketed pinnacles and gablets. When the church is entered, the reason for the apparently eccentric position of the porches is seen. They were so placed to give more space for the altars to the east of the transepts, and their successful effect is good evidence that no artist need ever distress himself about a want of regularity, if it is the result of a little common sense attention to convenience in the arrangement of his plan.

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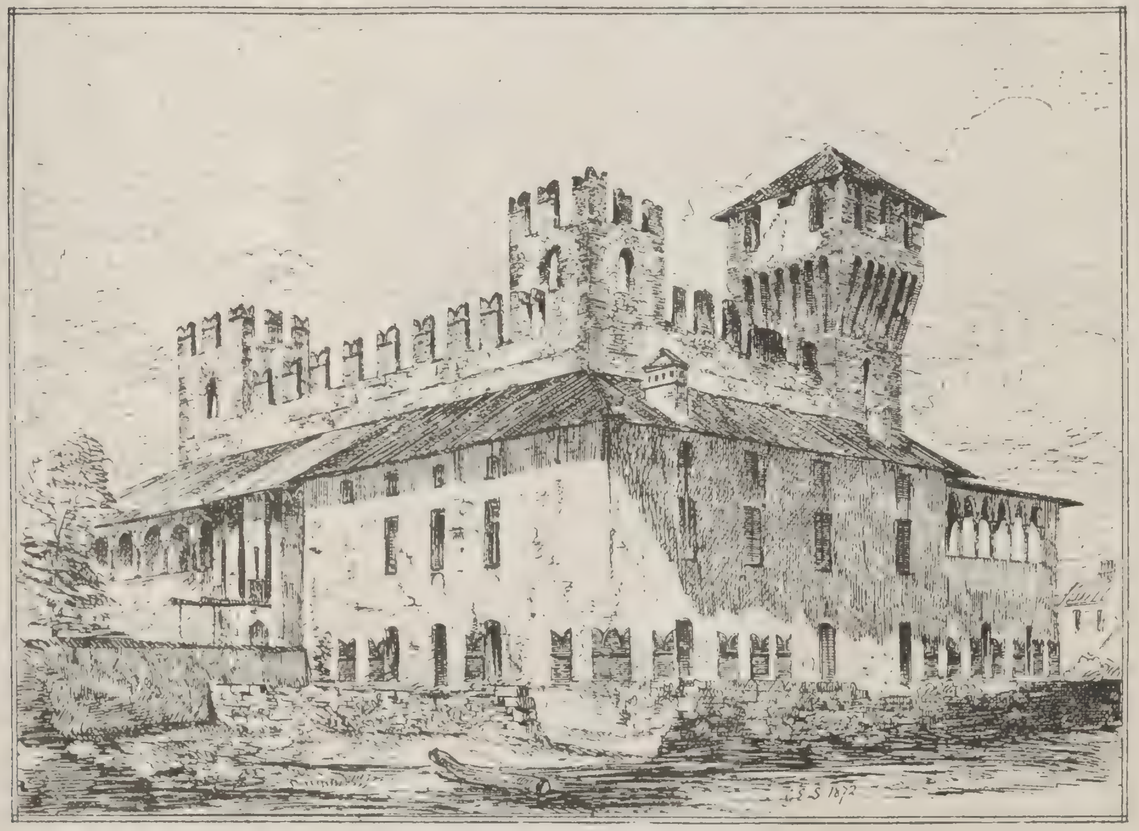
* The church was built in A. D. 1134 by Maestro Fedro.

* "✠ MCCCLX·MAGISTER·JOHANES·FILIUS·C·DNI·VGI·DE CAMPILIO·FECIT·HOC·OPUS." This Giovanni da Campione was one of a family of architects of much celebrity. See their genealogical tree in "Italian Sculptors," p. 106.

The southern side of the church gives a very fair idea of what the general character of the original building of 1134 was. The windows were very plain, the walls lofty, the roof flat, and ornamented with corbel-tables up the gables and under the eaves, and pilasters were used at intervals instead of buttresses. There is a central octagonal lantern which may be old, but which is entirely modernized. The most interesting remains are the various apses already mentioned. They are of two divisions in height, the lower adorned with very lofty, boldly moulded arcades, above which is an elaborate cornice, and above this again a low arcade on detached shafts, behind which the walls are considerably recessed to form galleries, which produce a very deep shadow. The capitals are elaborately carved, and the upper cornice is again very rich. Altogether, little as remains unaltered of the old fabric, it is enough to give an idea of a very noble and interesting phase of art. Near a doorway into the north chancel aisle the external walls have traces, faint and rapidly decaying, of some very exquisite frescoes, or, more probably, *tempera* paintings.

The steeple is in a most unusual position, — east, namely, of the south transept, — not less, I believe, than some three hundred feet in height, of good and very simple pointed character, without any approach to buttressing, and remarkable as having an elaborately arcaded string-course a few feet below the belfry windows, which have geometrical traceries enclosed within semicircular arches, affording, like the south transept porch, a curious illustration of the indifference of Italian architects to the use of the pointed arch where strength was not of consequence.



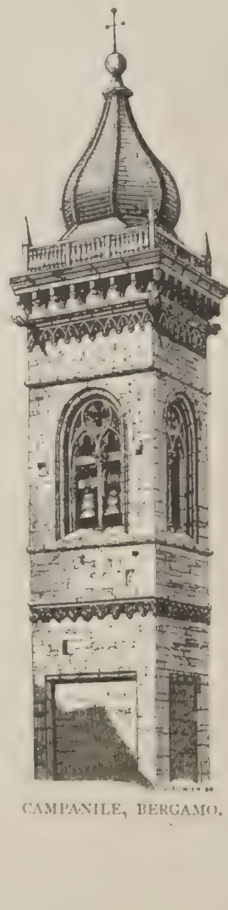
CASTLE OF MALPAGA.

Italian campanili have quite a character of their own, so distinct from and utterly unlike the steeples of Northern Europe, that this, the first Gothic example I had seen, interested me exceedingly. Perhaps its detail was almost too little peculiar, if I may venture to say so; for certainly it has left no such impression of individuality on my mind as has the beautiful campanile to whose grace so much of the charm of Verona is due.

The cathedral at Bergamo, which is close to the Broletto and Sta. Maria, may be dismissed in a word. It has been rebuilt within the last two hundred years, and appeared to be in no way deserving of notice. In a courtyard on its north side is a small detached polygonal baptistery, founded in 1275, which must have been very interesting. It is all built of marble, and richly adorned with shafts; but so far as I could see every portion of it has been renewed within a few years. Beside Sta. Maria Maggiore and the Broletto, we found little to see. Two churches — one in the Città, and another, desecrated, in the Borgo — have very good, simple pointed doorways, with square-headed openings and carved tympana; but beyond these we saw scarcely any trace of pointed work. We had a luxuriously hot day in Bergamo, and as we sat and sketched the Broletto, a crowd, thoroughly Italian in its composition and proceedings, gathered round us and gave us a first lesson in the penance which all sketchers must be content to undergo in Italy. Before long I found that my only plan was to start an umbrella as a defence, both against the sun and the crowd, and this, though not entirely successful, still effected a great improvement.

The walk down the hill to the Borgo was more pleasant than the climb up, and we were soon at our inn again, and then, after a most delicious luncheon of exquisite fruit and coolest lemonade, concluded by a very necessary dispute with our landlord about the amount of his bill, ending, as such disputes generally do in Italy, with a considerable reduction in the charge and the strongest expressions of regard and good wishes for our welfare on our way, we mounted our carriage, and were soon on the road towards Brescia.

Not far from this road and within about eight miles of Bergamo lies one of the most interesting of the many castles of which one so frequently sees remains in the north of Italy. This is the castle of Malpaga, which was inhabited by the famous Condottiere Bartolomeo Colleoni, of whom we have already heard at Bergamo, and of whom we shall see something again at Venice. It belongs now to a nobleman who lives in the Città of Bergamo, and leaves this old and stately pile to the keeping of his hinds, who tend his silkworms, gather his grapes, make his wines, look after his corn and cattle, and



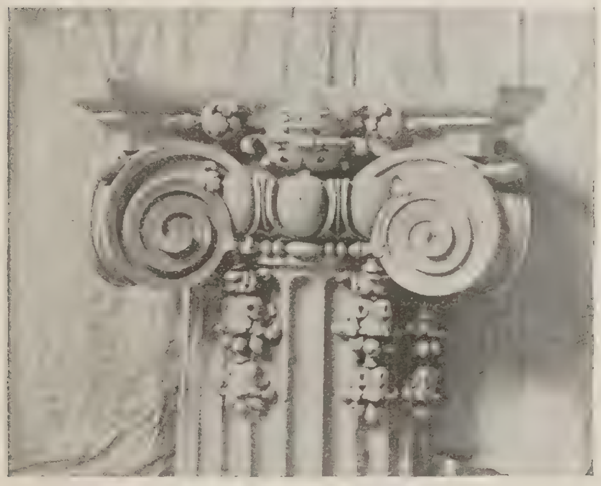
CAMPANILE, BERGAMO.

do as much as in them lies to gather the fruits which Mother Earth yields in these parts with such ungrudging profusion, but trouble themselves little about the preservation of the old castle or its belongings, seeing that they seem to give scant pleasure to their lord.

The castle as originally built was a square building enclosing a courtyard built of brick externally, and adorned with a forked battlement which is common everywhere in old buildings between this and Vicenza, and with four square corner towers, of which one larger than the others has a very bold and fine overhanging machicolated parapet. In the centre of the south front the drawbridge still remains in use, and was lowered for our exit from the castle. Outside the square castle was a space, and then a low wall again furnished with the forked battlement. This must have been a very picturesque arrangement; but unfortunately its real character is now only intelligible to the skilled eye. For the great Colleoni, finding himself in possession of a castle which gave him insufficient space for his magnificence, built up walls on the top of the old battlemented outer wall, and created his state rooms in the space between this new wall and the old external wall of the castle. These rooms of his have much damaged the effect of the outside of the castle; but internally they are still interesting, owing to the sumptuous character of the painted decorations with which he had them adorned. These were executed at about the time of the visit of Christian II. of Denmark to Colleoni, and are interesting if not great works of art. The old courtyard, though small, is very fine in its effect. The upper walls are carried on pointed arches and are covered with fresco or distemper paintings, said to have been executed by Giovanni Cariani of Bergamo, or by Girolamo Romanino of Brescia, extremely striking and attractive in their general style of color and drawing. The most picturesque incidents are illustrations of Colleoni's career, — the Doge of Venice giving Colleoni his baton in the presence of the Pope, and a fine battle subject.

A squalid area for rubbish, children, pigs, cats, and what not, is left all round the moat, and beyond this are all the farm buildings and laborers' residences, which go to make up the *tout ensemble* of a great Lombard farmyard. The surroundings are not clean nor very picturesque, but the castle itself has so great an interest that no one who visits Bergamo should pass it by unseen.*

(*To be continued.*)



TERRA-COTTA CAPITAL.
CARRÈRE & HASTINGS, ARCHITECTS.

THE accompanying detail from the Central Congregational Church at Providence was photographed before erection at the works of Stephens, Armstrong & Conkling, now the Philadelphia branch of the New York Architectural Terra-cotta Company. The terra-cotta all over this church is most charmingly executed. The brick was supplied by T. Milton Shafto & Co., of Philadelphia. Mr. F. J. Sawtelle, at Providence, superintended the work for Messrs. Carrère & Hastings.

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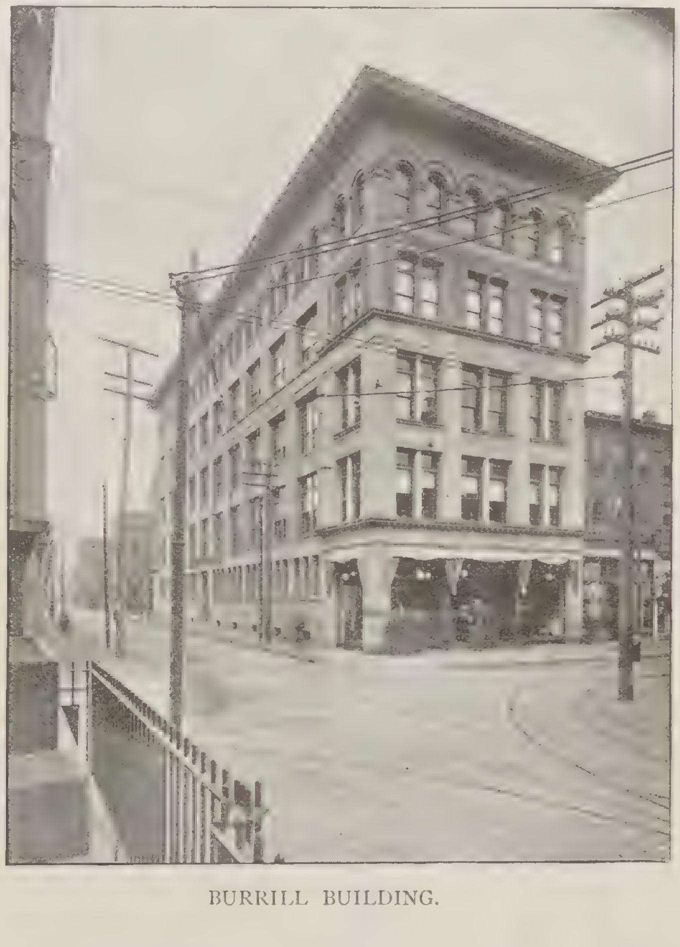
* The round church of San Tommaso in Limine, described by Mr. Gally Knight as similar in plan to San Vitale, at Ravenna, is only eight miles to the north of Bergamo, and ought, equally with Malpaga Castle, to be seen. I regret that I have never yet visited it.

RECENT BRICKWORK IN AMERICAN CITIES

PROVIDENCE.

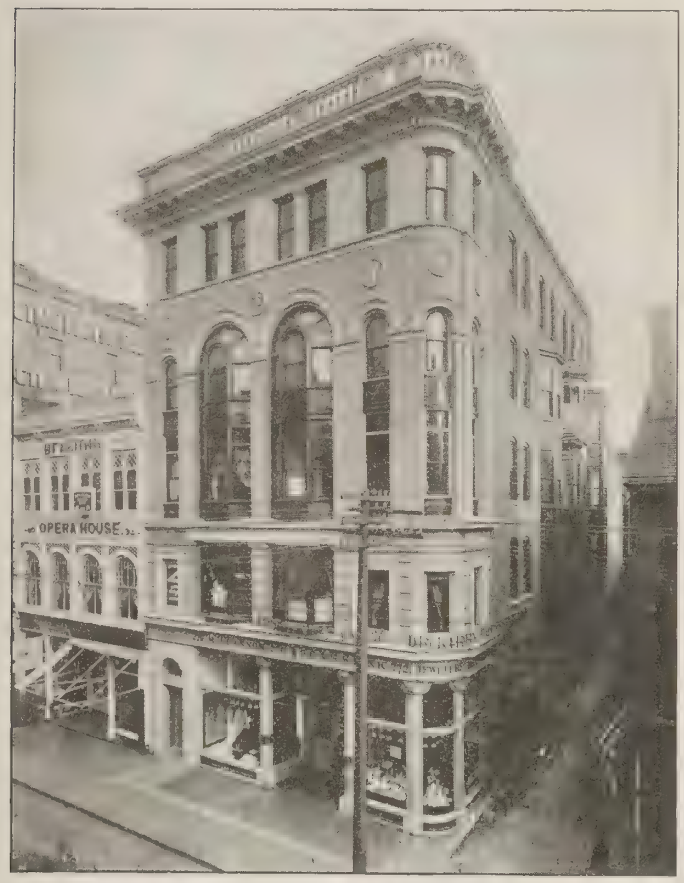
UNTIL within three or four years the public and business buildings of Providence have been either of stone or of the traditional brick with stone trimmings. Nearly all the private houses were of wood. Fifteen years or so ago Messrs. Stone & Carpenter did introduce terra-cotta on a large scale in Slater Hall, at Brown University, in the Hotel Dorrance, and in some private houses; but the quality of the work did not quite suit them, so the attempt was never followed up. And although these gentlemen have always seized any opportunity to make ornamental use of brick, yet, with the exception of some single panels, it was not until they built the Burrill Building, at the corner of Westminster and Mathewson Streets, that they again took up the new material.



BURRILL BUILDING.

The Burrill Building, however, is not altogether of clay material. The first three of the five stories on Westminster Street are of light stone supported by the usual plate glass and iron; those above, and the whole Mathewson Street elevation, are of brick with terra-cotta trimmings. A glance at the photograph will explain the treatment. The top story has round-arched openings, the fourth, on Westminster

Street, has windows with square heads formed by terra-cotta lintels which are supported in the centre by cleanly modelled columns of the same material, standing free, while the jambs are ornamented with a pattern in brickwork. The same arrangement, without the jamb ornament, is used on Mathewson Street. The color of the brickwork is light buff, with wide joints, while the terra-cotta is a little darker. While the distinction between brick and stone on the front is perhaps a trifle marked, the building as a whole is the best on the street. It is simple, dignified, and finely detailed.



TRAYNE BUILDING.

Mr. Ely's Trayne Building, nearly opposite the Burrill, is a studied design in gray brick and lighter terra-cotta, with very fine detail, and the whole makes one wish that he had not used copper bays to fill his three main openings, which rise through two stories and are round headed. The first story of iron and glass, with a side entrance of stone, leading to the offices in the upper stories, is very well handled.

Perhaps the best use of copper bays in this neighborhood has been made in the Conant Building, in Pawtucket, which is a city almost continuous with Providence, by Messrs. Gould, Angell & Swift. This design is executed in old-gold brick, with brownstone trimmings and galvanized iron cornice. The bays, on the side, are of small projection and are enriched with delicate Renaissance arabesques.

As an example of Renaissance detail, the Telephone Building of Messrs. Stone, Carpenter & Willson, of which the elevation has already been published in THE BRICKBUILDER, is worth careful study. Above a first story of iron and stone, better handled than such stories usually are, rise two stories of brick and terra-cotta, divided vertically by fluted pilasters, and crowned with a terra-cotta cornice and balustrade. Over each of the store fronts which flank the main entrance to the Telephone Company's offices projects in the second story a bay window, which in this case is of terra-cotta, with engaged columns at the corners, and highly ornate frieze and cornice. Even here it seems that the building would hardly lose in dignity if the bays were not used. The proportions of the buildings are right, and the detail is exquisite; do we really need the bays, finely handled as they are?

The outer walls of the Telephone Building carry the steel beams without the aid of columns, but the interior is all of skeleton construction; terra-cotta arches on steel beams are carried by steel columns, which, in their turn, are protected by terra-cotta. The roof is built in the same way and covered with concrete and asphalt.

The telephone wires in this city are carried underground in a sub-way accessible through manholes. When the cables reach the new building they pass under the sidewalk into a tunnel-like space partitioned off for them in the cellar, where they are carried on racks, projecting horizontally from each side wall until they reach the cable tower which communicates with the rest of the building only on the top floor at the distributing room. They are carried up the opposite sides of this tower, which is provided with ladders and with platforms every seven feet in height, on alternate sides, for convenient access to the cables. From the distributing room the wires are carried under the raised floor of the operating room to the switchboard.

The same architects have in hand the new Central Police Station for the city. This building is also in the Italian Renaissance, and, though not so ornate as the Telephone Building, has just as fine proportions and a very fine arrangement of masses. It is a good example of the truth, which our architects have been slow in learning, that however much good ornament may help a well-proportioned and well-massed building, such a building will lose none of its power or charm if it be left quite plain.

Though all of the terra-cotta work just spoken of has been done with Renaissance detail, as is indeed largely the case in other cities since the Classic style is once more in the ascendant, the material lends itself with equal ease to Gothic forms.

Another building now going forward for the city is the Museum of Art and Natural History at Roger Williams Park.* Here the architects, Messrs. Martin & Hall, have used yellow brick and terra-cotta together in a very pleasing way. The inspiration of the design, which is very refined and skilful, has been drawn from the French châteaux of the early Renaissance.

There is something very attractive in the outbreak again and again of the irrepressible Gothic spirit among the classic forms which were just coming into use in those old buildings. The style has all the picturesque quality which we enjoy in Gothic, while it is nearer our own time and taste in its forms; at the same time it is in its best work scholarly and refined without being so learned and precise as the Italian is apt to be, and withal it is perfectly adaptable to any needs which it may have to meet. All these points the architects have seized, and, while they have kept their work simple and dignified and have avoided all temptation to be picturesque and use angle turrets and other startling effects, they have allowed their fancy considerable play in the details.

Thus far the city work is in competent hands. But a stop is soon to be put, it seems, to this sort of nonsense. There is a resolution now before a committee† of the Common Council (it has been passed by the Aldermen, and I understand the Mayor favors it), which will turn over the official architecture of the city to the tender mercies of the city engineer's office! The scheme seems to be not to create the office and department of city architect, but to add to the force of the engineer's department a few architectural draughtsmen and an architectural superintendent.

Of course all interested in art foresaw the result. The Chapter of the Institute here took up the affair and tried to make a fight for reasonable methods of doing business. The tide is too strong and they have had to drop the matter. The Council think they are saving money, and they are blind to any other view. The engineer's department costs fifty-three thousand dollars a year. For four recent years, — years, too, in which there was more than the average amount of building, — the city paid about seven thousand a year for architects'

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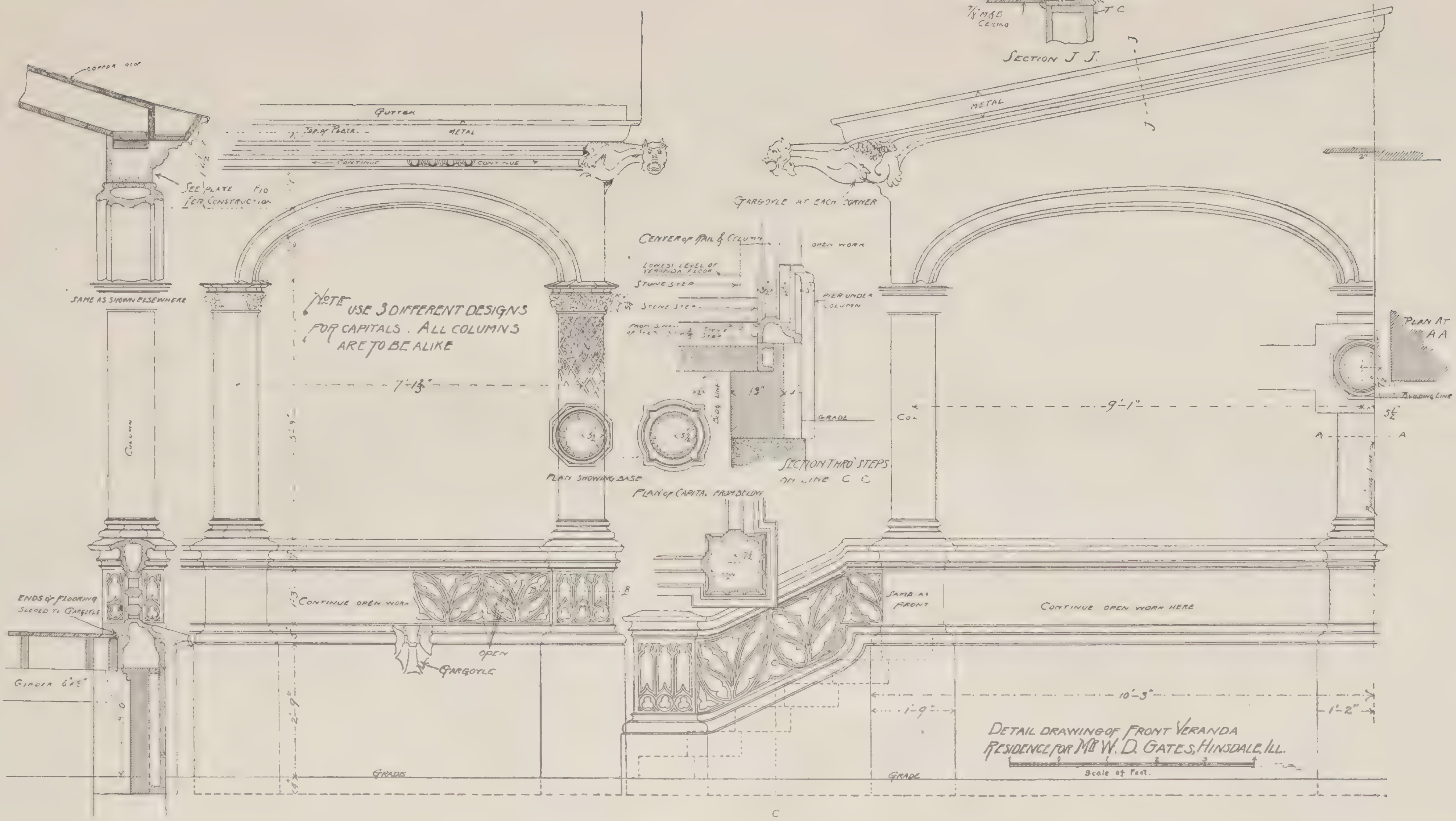
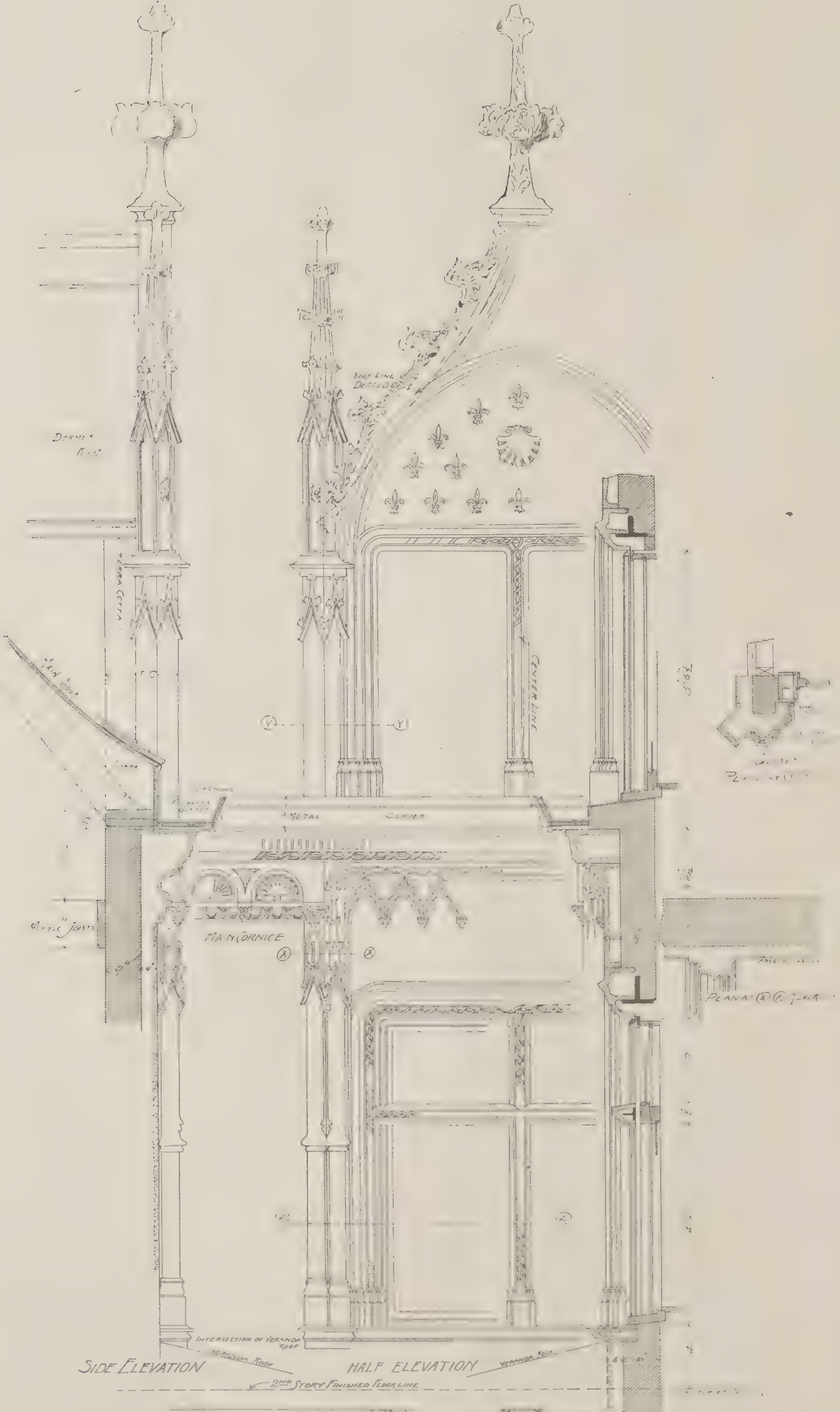
* A scale detail of part of this building was published in the last number of THE BRICKBUILDER.

† The resolution has been tabled by Council, I am informed, and there the matter now stands.



DETAIL, RESIDENCE OF W. D. GATES, ESQ., HINSDALE, ILL.

MESSRS. JENNEY & MUNDIE, ARCHITECTS, CHICAGO.



DETAIL, RESIDENCE OF W. D. GATES, ESQ., HINSDALE, ILL.

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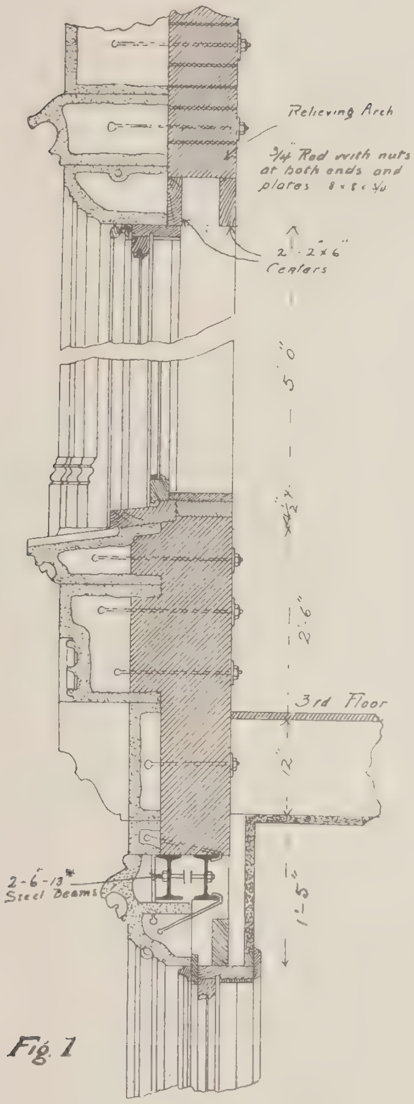
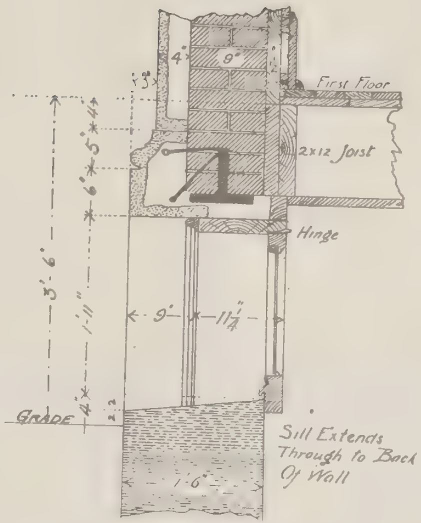


Fig. 1

SECTION AT DORMER IN TOWER SHOWING CORBELLING.



SECTION OF COAL CHUTE WINDOWS

Fig. 3.

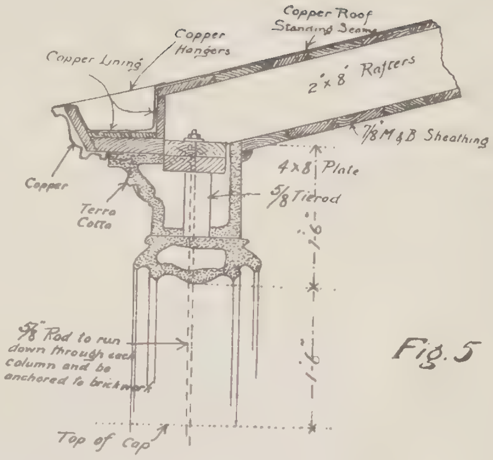
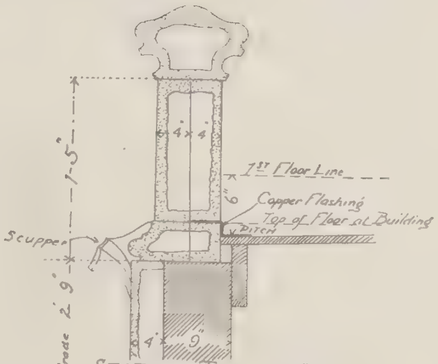


Fig. 5

SECTION THROUGH VERANDA CORNICE



SECTION THROUGH REAR PORCH RAILING, SOUTH ELEVATION.

Fig. 4.

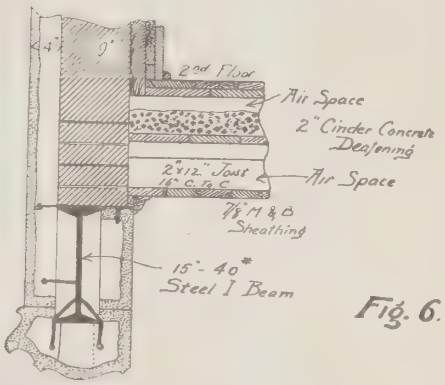


Fig. 6.

SECTION THROUGH ARCH AT REAR OF HOUSE

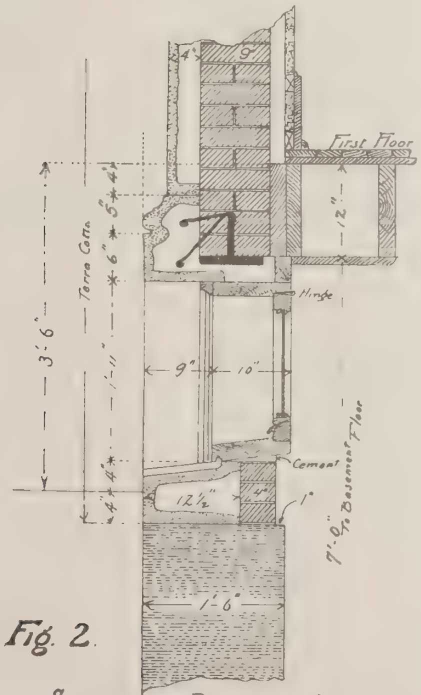


Fig. 2.

SECTION OF BASEMENT WINDOWS

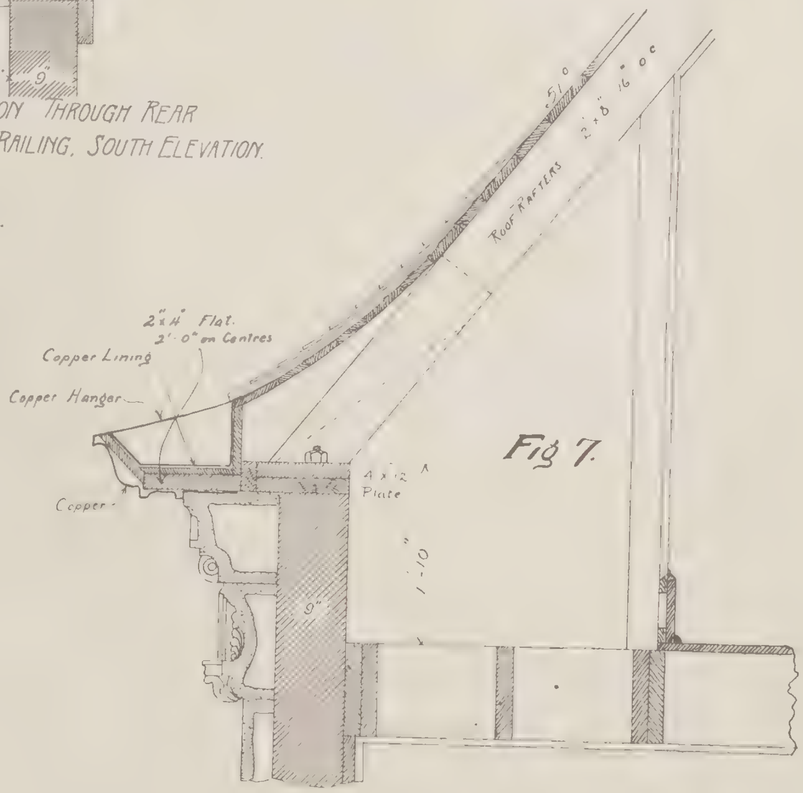
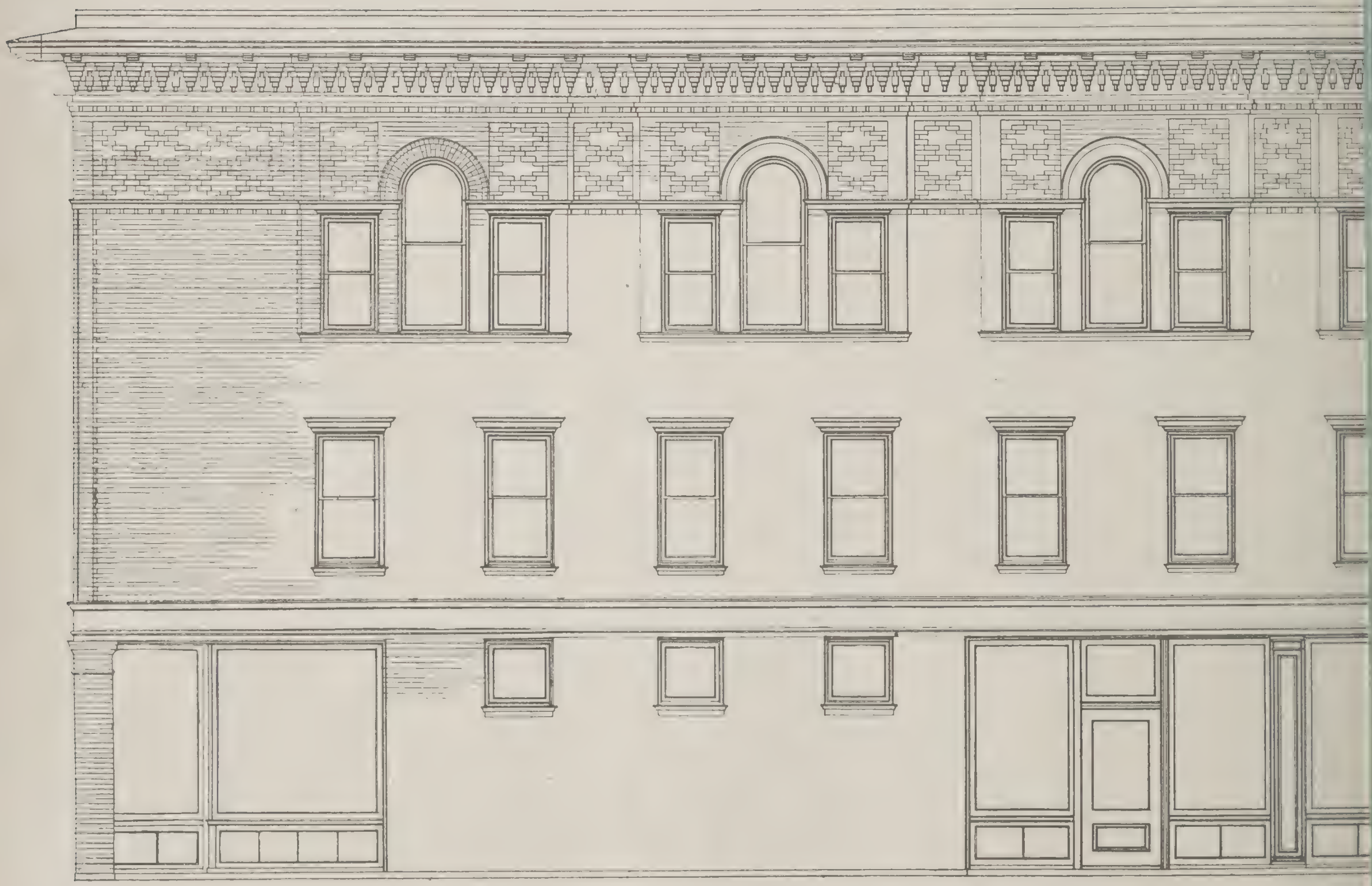


Fig 7.

SECTION OF MAIN CORNICE

DETAILS, RESIDENCE OF W. D. GATES, ESQ., HINSDALE, ILL.

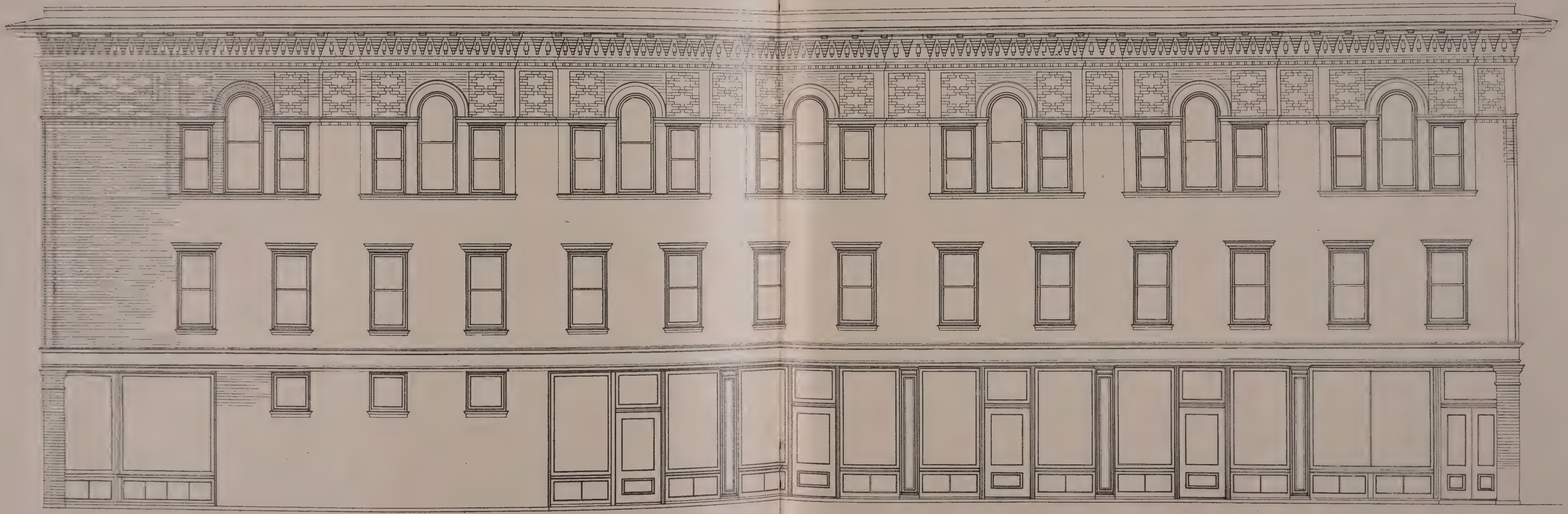
MESSRS. JENNEY & MUNDIE, ARCHITECTS, CHICAGO.



SIDE ELEVATION, STORE AND OFFICE BUIL

(ONE-EIGH

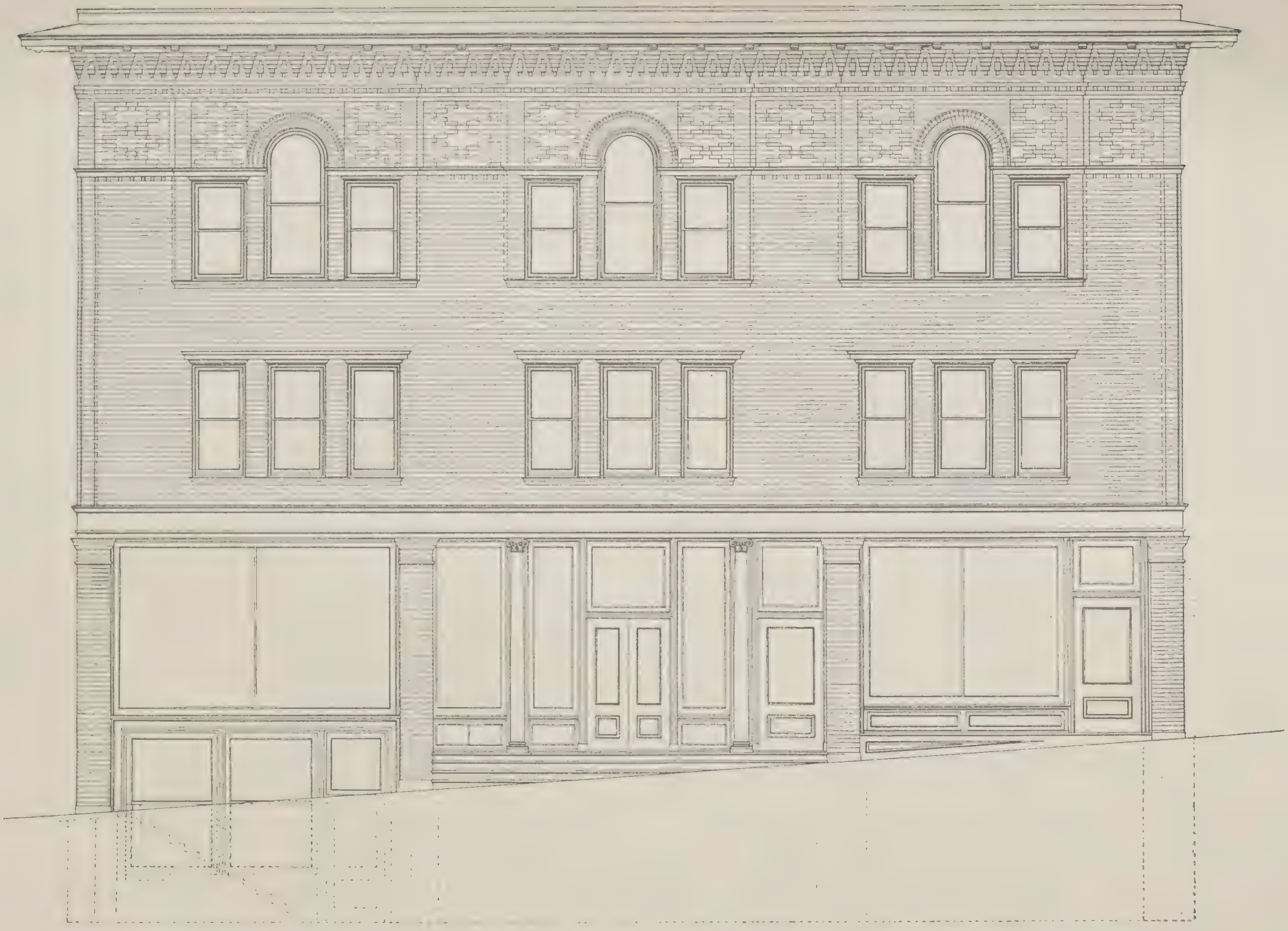
MESSRS. WALKER & KIMBALL, A



SIDE ELEVATION, STORE AND OFFICE BUILDING FOR D. C. PATTERSON, ESQ., OMAHA, NEB.

(ONE-EIGHTH-INCH SCALE.)

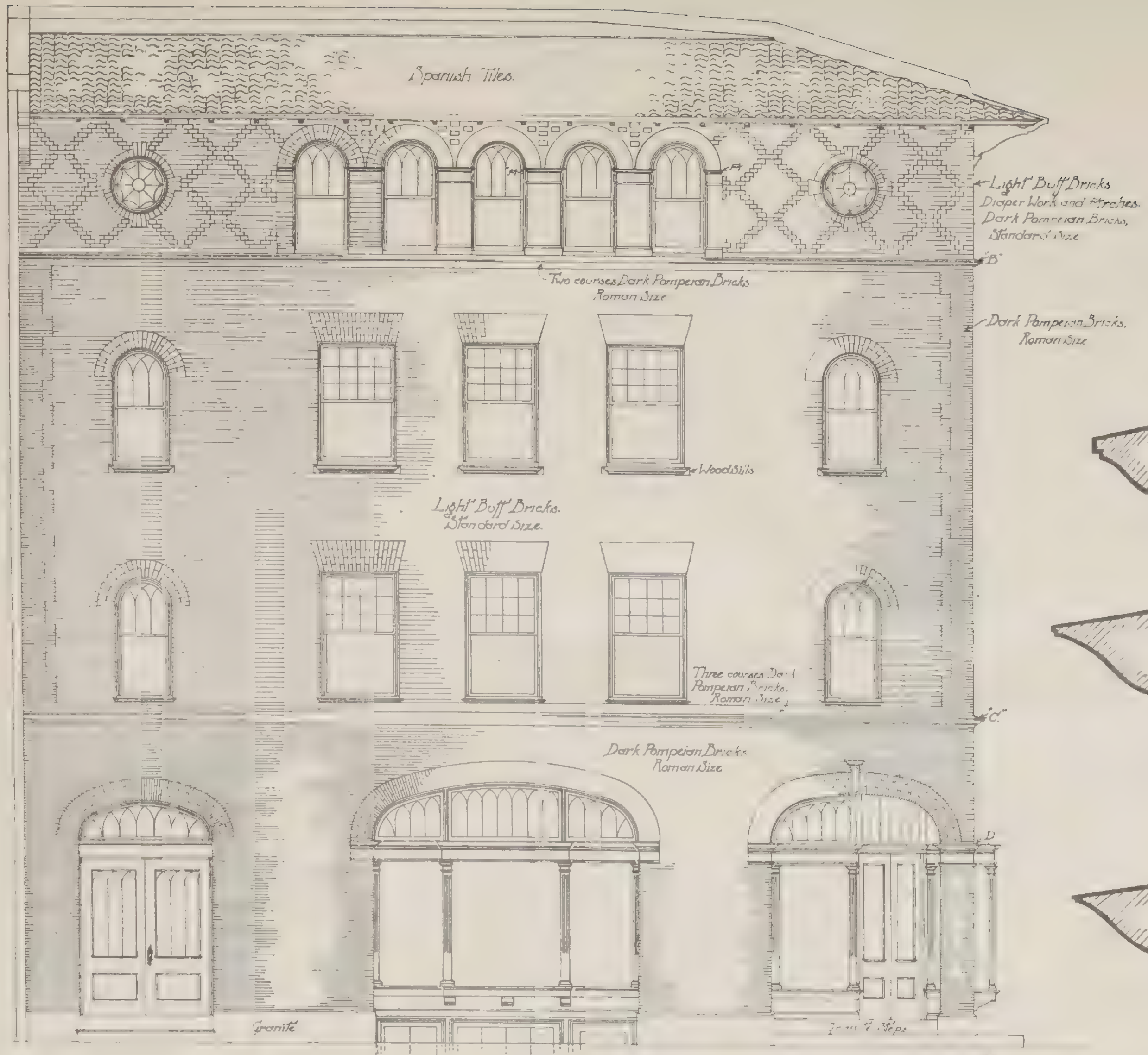
MESSRS. WALKER & KIMBALL, ARCHITECTS, BOSTON AND OMAHA.



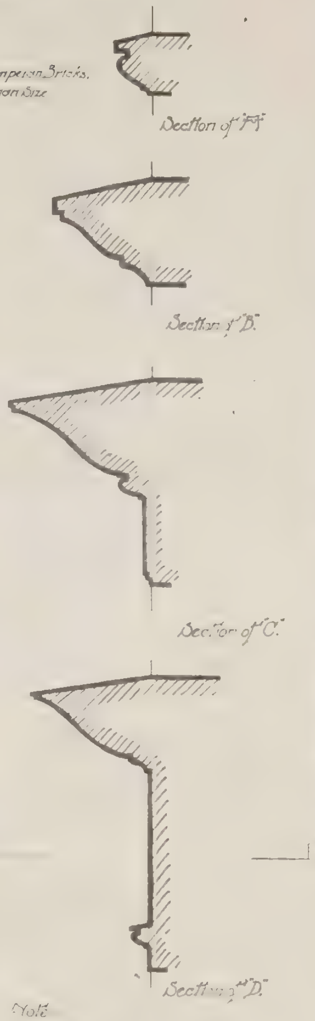
FRONT ELEVATION, STORE AND OFFICE BUILDING FOR D. C. PATTERSON, ESQ., OMAHA, NEB.

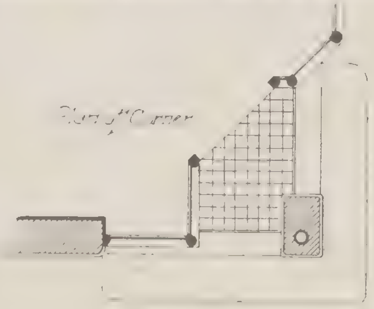
(ONE-EIGHTH-INCH SCALE.)

MESSRS. WALKER & KIMBALL, ARCHITECTS, BOSTON AND OMAHA.

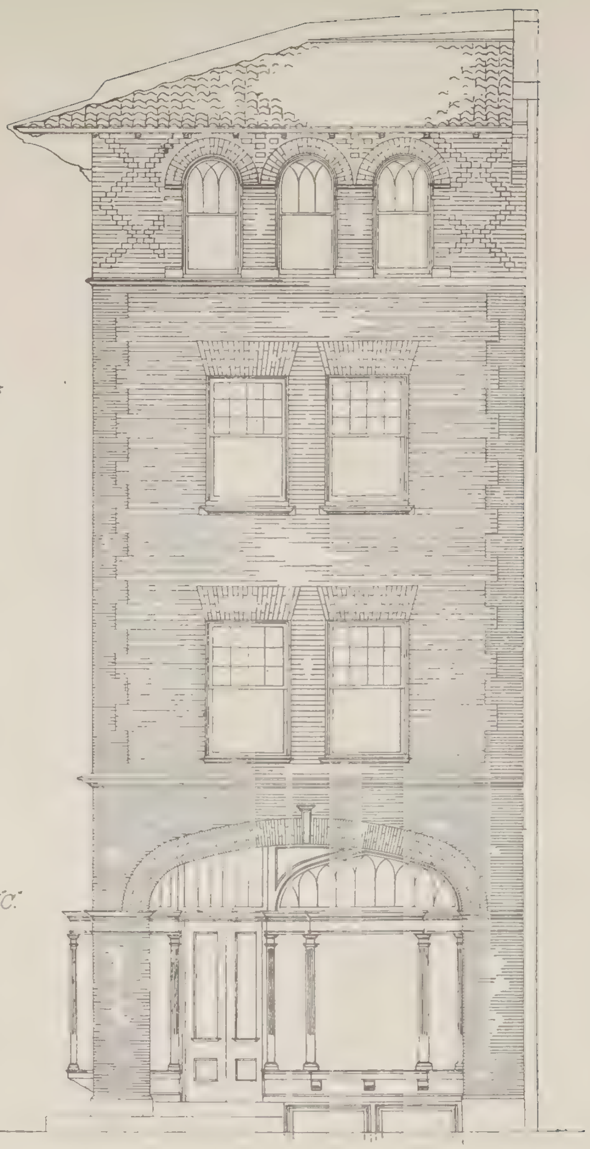


Side Elevation.



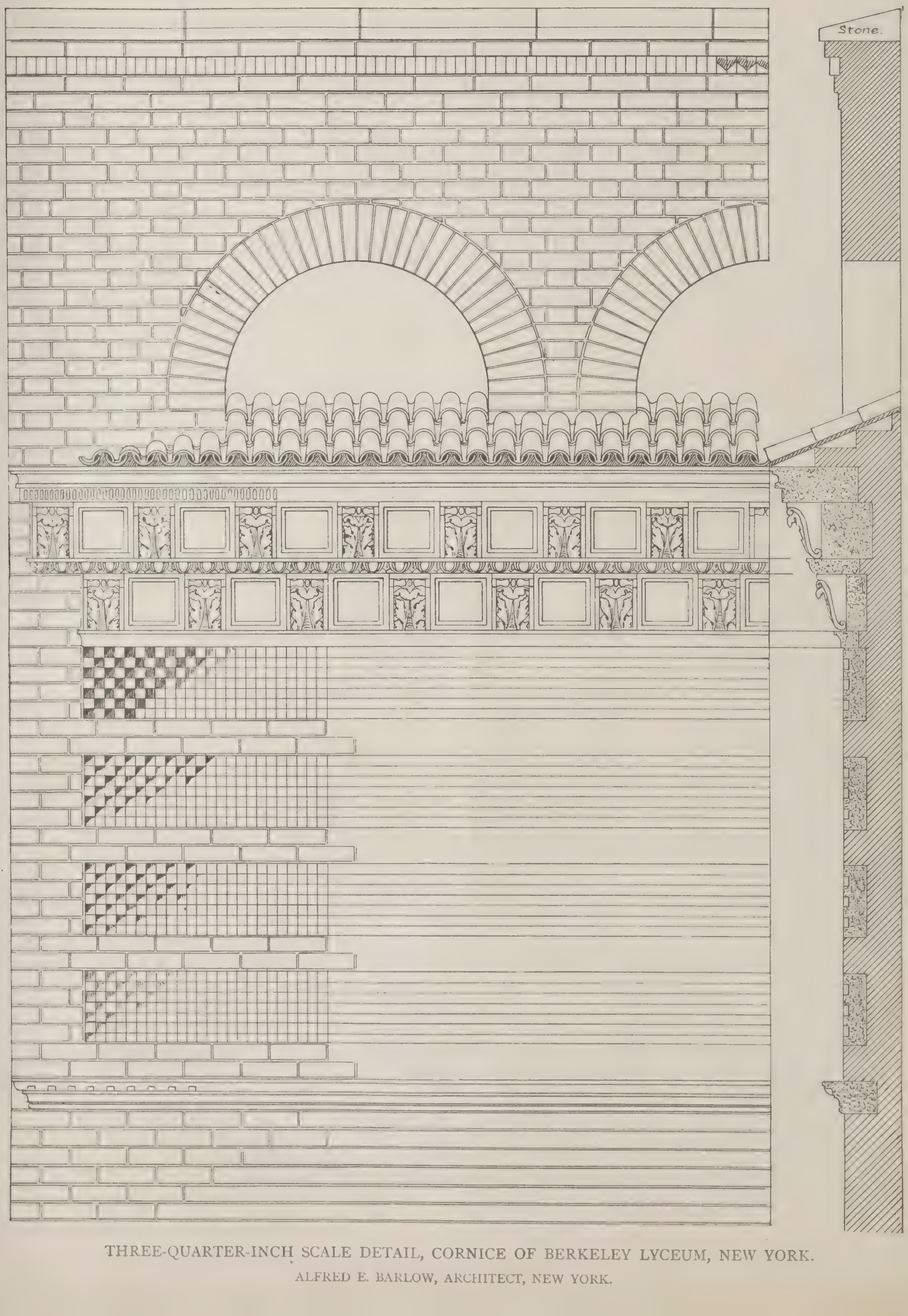


Note
All Terra Cotta same color
as Dark Pompeian Brick.



Front Elevation.

Henderson Building, N.E. Corner
11th and Race Sts., Philadelphia, Pa.
Yarnall & Goforth,
Architects,
14 S. Broad St. Phila, Pa.

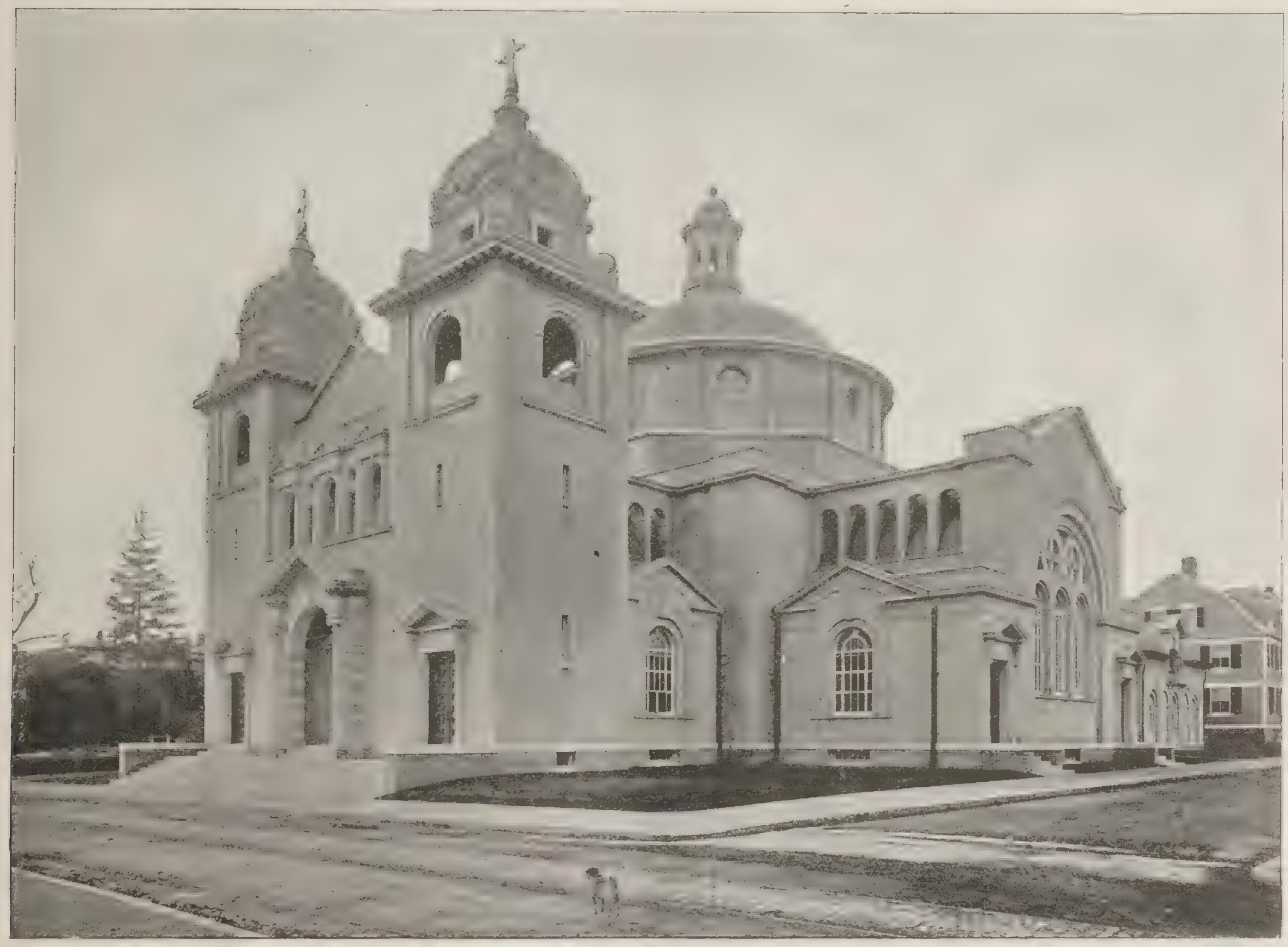


THREE-QUARTER-INCH SCALE DETAIL, CORNICE OF BERKELEY LYCEUM, NEW YORK.

ALFRED E. BARLOW, ARCHITECT, NEW YORK.

commissions. That this sum, which is only a trifle over the engineer's yearly salary, is extremely low when considered as the cost of a city architect's department, and that for this sum it is possible to obtain first-class work, while if architectural draughtsmen are added to the engineer's department, it must augment the cost and at the same time lower the character of the work, — all this seems not to enter their thoughts. We can save money — why can't the engineer take care of the work? Before such questions the extravagant architects retire abashed, for with such men those questions cannot be answered. It is the old story of the materialist against the idealist, of science against poetry,. and, unfortunately, the judges are prejudiced and must be educated by experience.

the most aristocratic street in the town, yet the course of empire, moving eastward this time, had long since carried the greater part of its congregation into the newer and more fashionable part of the "East Side." The new church, therefore, stands on quite high ground in one of the pleasantest spots in the city, and in one where the best architectural effort of the last few years has had a chance to show itself, for around the church are houses by Messrs. Stone, Carpenter & Willson, Rotch & Tilden, Gould, Angell & Swift, and W. E. Chamberlain. Mr. Sawtelle, the architect who had charge for Carrère & Hastings of the erection of the church, has built the parsonage beside the chapel, and Martin & Hall are now filling the last vacancy in this Stimson Avenue colony.



CENTRAL CONGREGATIONAL CHURCH, PROVIDENCE, R. I. MESSRS. CARRÈRE & HASTINGS, ARCHITECTS, NEW YORK.

St. John's Church, on North Main Street, to turn to a pleasanter subject, has within a year or so finished a parish house designed by Messrs. Peabody & Stearns. The material is yellow brick of different dark tones, and the treatment is very simple and quiet, and depending for its effect not upon ornament but upon mass, proportion, and the color harmony of the different bricks employed.

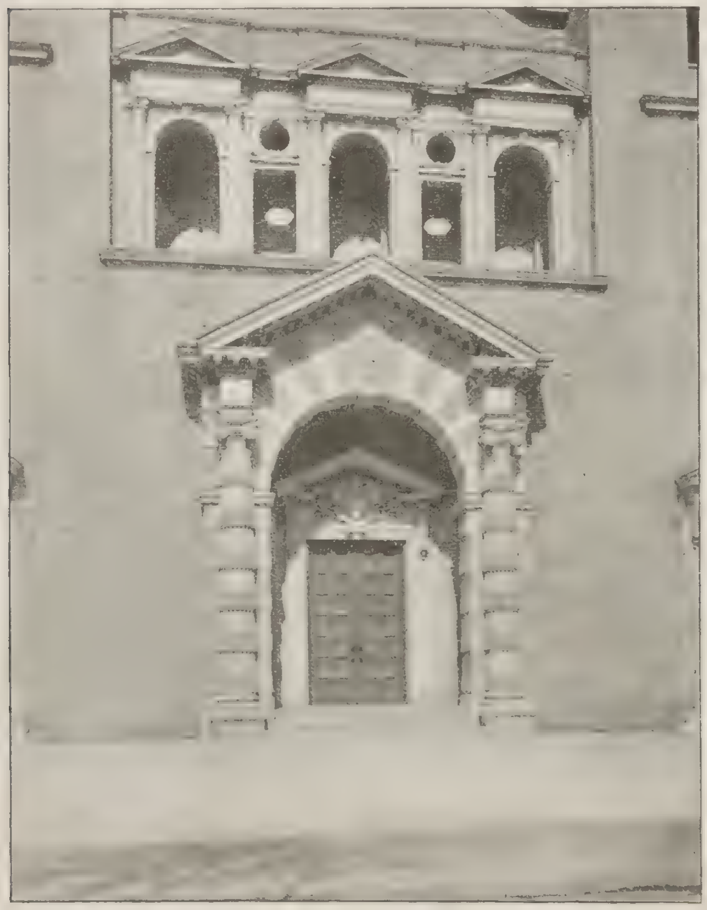
The old St. John's itself is of stone, but there are several brick churches in Providence. Some of them are exceedingly evil in design, one of them attains to no mean rank, and that one only, of which more in another article, can be compared with the new building which Messrs. Carrère & Hastings have recently built for the Central Congregational Church. The growth of the city has left several churches, still occupied, on streets which are now more or less crowded thoroughfares. Though this was not the case with the Central, whose old church, built about fifty years ago, was then upon

But these houses, save here and there the first story of one, are not of brick, and we must return to the church. The mass of it, as seen from a distance, and it is on high enough ground to be seen in some directions from far away, is very good, though possibly the dome is a little flat. All the near views of the church are good. The best of course is one of those which bring the tambour over the crossing into the centre of the picture. The view from the east end, really the north end, up over the chapel and the apse, is full as fine as from the front. The mass from these points is most excellent, though the tambour is a trifle bare and perhaps the cornice of the dome is a little too shelf-like for the splendid detail of some of the other parts of the church.

The view we have just taken emphasizes the cruciform plan of the church, with its chapel behind the semicircular apse. The west front, here really the south front, has the traditional two towers, the three doors, and the central windows, though these here are blank, all beautifully handled, with some of the feeling of the old Spanish work of the Southern Americans, but with the clean-cut, classic detail of Italy. A short nave, with a barrel vault,— a real barrel vault of tiles,— forming the roof as well as the ceiling, a nave which has its regular side aisles, leads us to the crossing over which, sustained by the four heavy brick arches which form the square and by the pendentives drawing the square into an octagon, and then into a circle, rises the tile dome. Transepts extend with their side aisles east and west, and an unlighted, early-Christian-looking apse with its *concha* or hemispherical roof, forms the sanctuary on the north, here the ecclesiastical east.

The interior detail of the church is very fine and interesting. The organ loft is somewhat unsatisfactory in execution, though the design is excellent. The angel figures with musical instruments, instead of being modelled in full round, or in relief against a background, are in low relief, with the background cut through, and the effect troubles one.

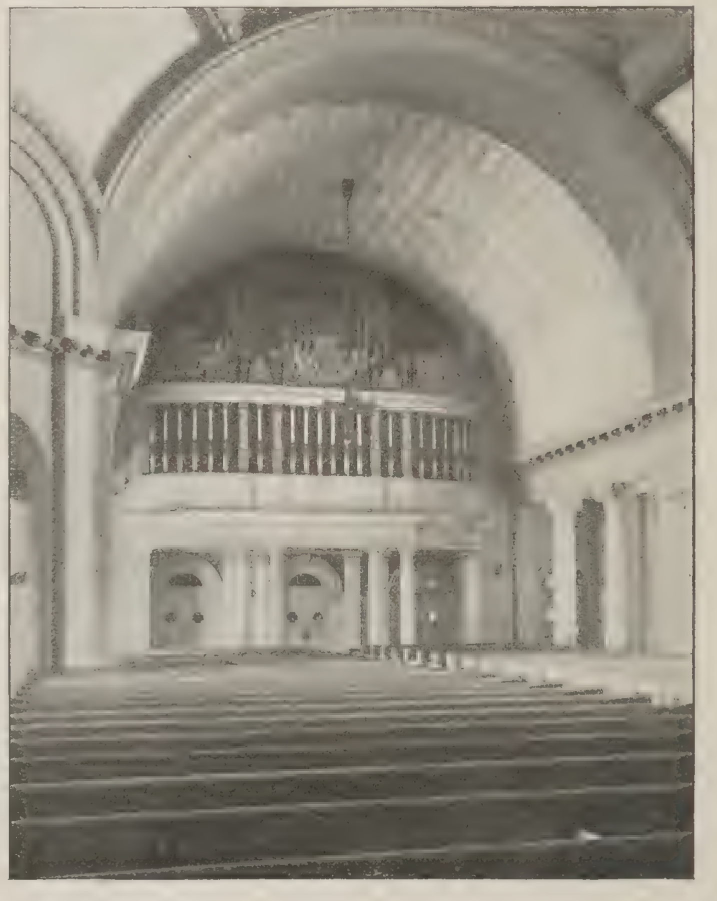
Aside from the organ loft, the pews, the pulpit, and the sanctuary furnishings, which are of wood and very finely detailed, the interior detail is of terra-cotta and of plaster. The tiling of the dome and of the vaulting shows inside, except in the apse. The brickwork is plastered. It is of course intended to decorate the whole church in color after the manner of the beginning made in the apse dome, and if Mr. Schladermundt has the chance to finish the work as he has begun, the church will be an example of what color decoration ought to be as a support to architecture.



CENTRAL CONGREGATIONAL CHURCH. FRONT ENTRANCE.

The color scheme of the outside of the church, too, has been well handled. Buff bricks, which here have a pinkish tinge, and there have turned a beautiful green under the weather; light terra-cotta, beautifully modelled; tile roofs of a dull, purplish red, with terra-cotta lantern again over the dome, and gilt crosses on the towers, on which the terra-cotta at the roof angles contrasts well with the tiling, form a very pleasing combination.

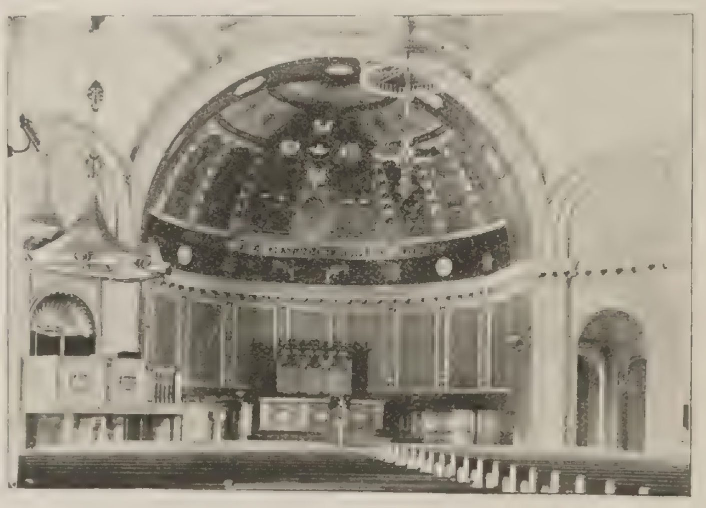
The crosses on the towers and the cruciform plan of the church show the progress toward ritualism which the "Lord Brethren," as Blackstone called them, are making in the wake of the "Lord Bishops." In fact, considerable has been the comment on the action of a sober Congregational society in building its "meeting-house" in a style which reminds the laity, at least, of cassocks and berettas.



CENTRAL CONGREGATIONAL CHURCH. ORGAN LOFT.

To the architect, of course, the question simply reads, Does the building meet the requirements of the problem and does it meet them beautifully? Whether Renaissance or Gothic is the more to be preferred for churches, is a mere matter of personal taste. This church seems to meet its problem beautifully. There is, then, no need to talk, after all, of denominational fitness or unfitness as absolutely fixed, for this or that style. Let the architect go straight through the problem with his best ability according to the best taste he has, using such forms as seem to him pleasing, and, if he is an architect, he need not be afraid of the verdict.

NORMAN M. ISHAM.



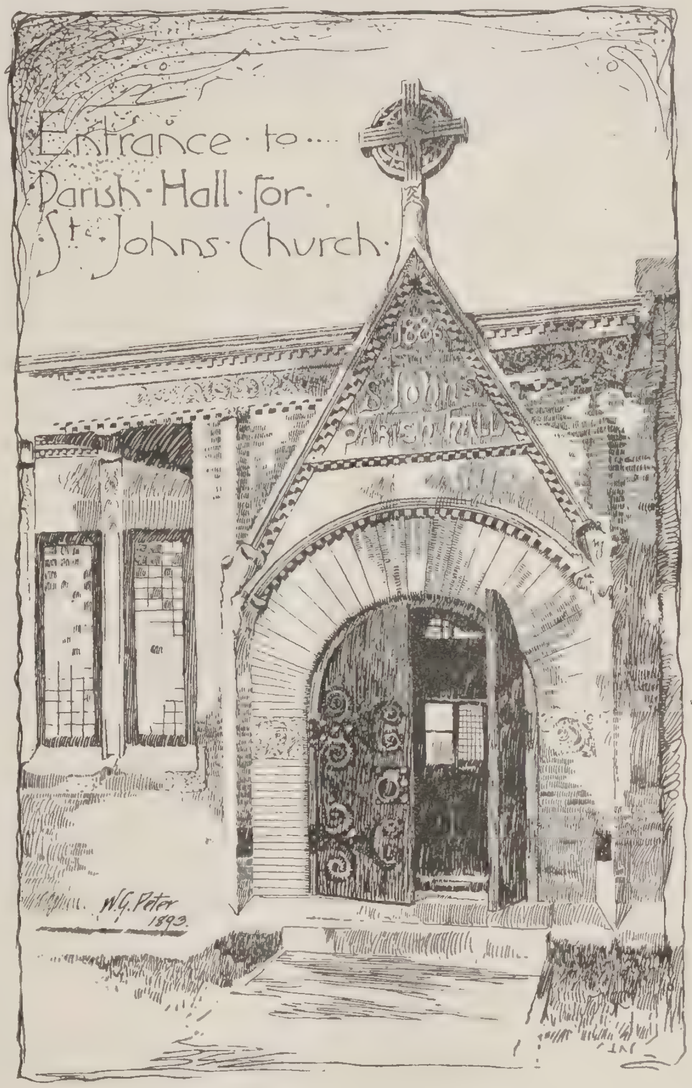
CENTRAL CONGREGATIONAL CHURCH. PULPIT.

WASHINGTON.

SUCH a variety of styles, if I may call them such, are to be found in Washington that the cultured visitor is really bewildered as he walks up and down its streets. On every hand one finds hideous examples of what the average citizen points to with pride and calls "modern architecture."

Here and there the eye is relieved by the sight of a quiet front, so modest and retiring that it seems to shrink from the loud clothes and gaudy finery of its ostentatious neighbors. It is scarcely noticed by the novice, and if at all, the remark is heard: "Anybody can design a thing like that."

These quiet fronts are, for the most part, relics of the taste of the past, and show great skill and refinement in the relative proportions of openings to wall surfaces. Built of hand-made pressed brick of delightful color, crowned with good cornices, usually of moulded brick painted white, of a pattern not now in stock, with doorways generally of Colonial treatment, they stand as landmarks of the artistic appreciation of two generations ago. One who has not seen them cannot imagine the charming effect produced by these cornices of brick. The projection is not great,—about four and a half inches. The soffit is ornamented with mutules, and the returns at the corners with the conventional honeysuckle, as is so often seen in the Greek Doric.



(SEE ARTICLE ON THIS PAGE.)

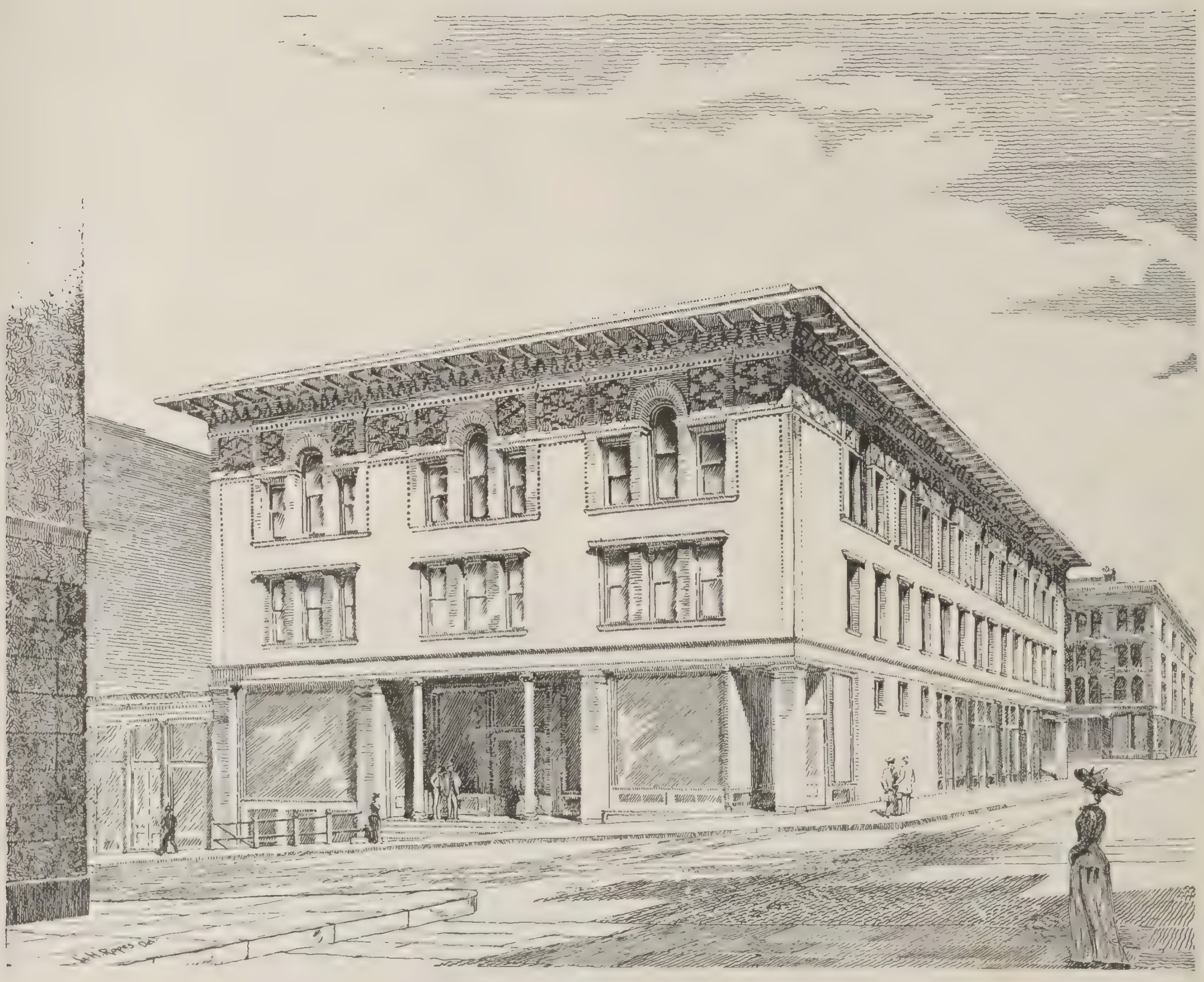
Apparently the architects of Washington have but recently thoroughly appreciated the artistic possibilities of terra-cotta in combination with brick, and many still are learning. Preferring stone for the solution of their problems of decoration and construction, the examples of really good treatment of brick fronts are the exception, not the rule. Here, as in other Eastern cities, public taste is improving sufficiently to be able to distinguish the superiority of the present work over that done ten years ago, and to wish for more. This is a good sign, and we may well feel glad that it is so.

Of private residences done in brick, those of John Hay, Esq., and General Anderson, designed by H. H. Richardson, are probably familiar. They are very quiet, moulded brick being confined to the base courses and cornices. The wall surfaces are given life and color by pattern-work, and often hexagonal shaped brick are used, which, from their peculiar shape and color, make the design more pronounced. Many houses by Hornblower & Marshall have well-studied brick friezes, surmounted usually by copper cornices, lending character to otherwise plain but well-proportioned fronts. The house of Representative Dalzell, on New Hampshire Avenue, has the wall surfaces of the façade slightly enriched by pattern-work of darker headers. The entrance is unique in its way. It is a semicircular opening within a square frame, framed by a running conventional design carved in lighter brick, making the whole quite Moorish in feeling.

A very nice bit of brick and terra-cotta work is that of the Parish Hall of St. John's Church, on Sixteenth Street. It is to be regretted that it is so small, as a larger building worked out in a similar manner could not fail to be an ornament to the city. The Army and Navy Clubhouse shows what refinement can be gotten by the use of perfectly plain, rough red brick with red mortar joints. Perhaps the most striking example of a structure wholly of brick and terra-cotta is the United States Pension Office. This building has been the cause of as much comment, both of praise and condemnation, as any building ever erected in the District of Columbia. Its popular name is the "Beer Brewery." One well-known gentleman of high standing has been known to remark of it, "The only fault with it is, it is fireproof." All this adverse criticism arises from its having a hideous, barn-like structure towering above the main roof, entirely out of keeping with the building proper, and forming the roof of the large court. Moulded on the lines of the Palazzo Farnesi at Rome, the principal façade is considerably longer. By thus altering the proportions, a good deal of the character of the original is lost. But, standing at a point where the ugly cupola cannot be seen, the building is very imposing and quite pleasing. The details are entirely of terra-cotta, and well executed.

In the new power-house of the Washington and Georgetown Railroad Company, by Burnham & Root, the design fully expresses the character of the building. It is of dark-red brick with black mortar joints, and has just enough stone to relieve the monotony. Terra-cotta might have been substituted for the stone without artistic loss. Many residences recently erected are of various shades of buff and mottled brick. One in particular, on the corner of Massachusetts Avenue and Twenty-first Street, is worthy of notice, as in it the attempt has been made to grade the color from chimney top to ground level from dark to light, with considerable success.

It is to be regretted that, with so many colors from which to choose, more harmony among buildings in the same block cannot be gotten. Perhaps an improvement might be made if there were more concerted action on the part of the architects. While slight differences of color do not cause any one to deter from the harmony of the whole as viewed from a distance, when we see jumbled together red, white, yellow, brown, with perhaps here and there a green one, the effect is anything but pleasing. The very fact that they have such variety



STORE AND OFFICE BUILDING FOR D. C. PATTERSON, Esq., OMAHA, NEB.
Messrs. Walker & Kimball, Architects, Boston and Omaha.

of color to choose from is their undoing. It is a case of embarrassment of riches, which the able man may know well how to handle with the taste insuring the best results, but which the average unartistic builder-architect considers his opportunity to concoct something original.

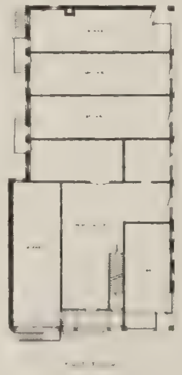
Many buildings have details in brick and terra-cotta so good as to save the whole from utter failure as works of art. Chimneys, doorways, cornices, gables, can be picked out all over the city as being better than the buildings they adorn. The cornice of the new addition to the Washington Gas Light Company's offices, a sketch of which is here shown, is a good sample. E. W. Donn, Jr.

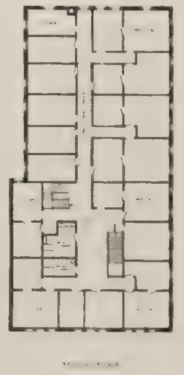
PLATES.

Plates 25, 26, and 27 are illustrative of the first article published in this number.

Plates 28, 29, and 30 give the two elevations of the building shown by the prospective sketch on this page. The plain walls are laid with sand-struck common hand-made brick (light burned). The trims are of red front brick (Omaha Hydraulic-Press) somewhat darker than the others. Joints white for body, red for trims, and tuck-pointed.

Plate 31. Henderson Building, Philadelphia, Yamall & Goforth, architects. The brick were furnished by the Eastern Hydraulic-Press Brick Company and the terra-cotta by Stephens, Armstrong & Conkling before their consolidation with the New York Architectural Terra-Cotta Company. The plate is one-eighth-inch scale.





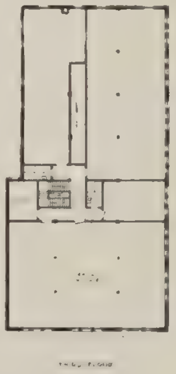


Plate 32. Cornice of the Berkeley Lyceum, New York, Alfred E. Barlow, architect. Terra-cotta work by the New York Architectural Terra-Cotta Company. This is a good example of a brick and terra-cotta cornice with practically no projection, gaining in height what it loses in projection.

THE BRICKBUILDER.

AN ILLUSTRATED MONTHLY DEVOTED TO THE ADVANCEMENT OF ARCHITECTURE IN MATERIALS OF CLAY.

PUBLISHED BY

The Brickbuilder Publishing Company,

CUSHING BUILDING, 85 WATER STREET, BOSTON.

P. O. BOX, 3282.

Subscription price, mailed flat to subscribers in the United States and Canada	$2.50 per year
Single numbers	25 cent
To countries in the Postal Union	$3.00 per year

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Entered at the Boston, Mass., Post Office as Second Class Mail Matter, March 12, 1892.

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A PROMINENT manufacturer of terra-cotta criticises the editorial in our last number, on brick and terra-cotta coloring, as apt to give architects a wrong view of the subject. He himself takes exactly the opposite view from that of our editorial, and supports it with these arguments.

A brick manufacturer will sort a kiln of bricks of one color, into ten or twelve different shades, and of each shade he will have enough stock to supply an ordinary job. Now, while the application of color by a "slip" is simple enough, burning it to exactly a certain shade is not so easy. If, for instance, an architect wishes uniformity in brick and terra-cotta, and selects one of the several shades of a certain colored brick, the terra-cotta manufacturer may have considerable difficulty in exactly matching it, although he would strike so near it as to match a shade two or three degrees above or below the one selected. The architect, then, it is suggested, should give the terra-cotta manufacturer the first place, allowing him to make a color to match a certain *color*, not a certain *shade* of brick, though keeping his terra-cotta of a uniform tone. The terra-cotta will certainly match one of the several *shades* into which that color of brick is sorted, and that shade can be taken for the work.

OUR article in the last number was written from the recent experiences of several architects who had tried to have a brick made to match terra-cotta, and possibly the inspection of a very well-equipped terra-cotta plant was so fresh in our minds that we over-estimated the ability of terra-cotta manufacturers to produce exact matches. However, having stated the criticism as nearly as we remember it, let us suggest that this criticism might not apply to the cases we had in mind. Brick manufacturers are not found in every market, carrying stocks of a large number of different colors. Suppose the brick the architect wanted was not to be had in his locality, in stock. It could be made, and come pretty close to the required shade. The question is, Can the average well-equipped brickyard make a special run of brick and closely match a certain shade, easier than one of the scientifically operated terra-cotta factories commanding every facility for securing special color-work? We still hold to our position, with a concession in the case of the several large cities where every variety and shade of brick is found in stock, and there is no need of having a color made to order. As, however, we base our opinions upon the experiences of a comparatively few architects, we invite correspondence for publication, from both manufacturer and architect. If there is any question as to which is the better and fairer method, THE BRICKBUILDER columns are the place for its discussion.

MR. GLENN BROWN of Washington, in his article "Government Buildings compared with Private Buildings," in the *American Architect* of April 7, gives some interesting tables showing cost and time of construction, and completion of first, second, and third class structures, from which the following averages of cost are instructive. Eight first-class structures, that is, structures that are fireproof throughout, cost an average per cubic foot of 37¼ cents. Six buildings of the second class, erected of less costly materials, but with iron beams and terra-cotta or brick arches for the floors, averaged 24½ cents per cubic foot. Only two buildings of private nature are included in the third class, which is plain brickwork, and wooden joists and flooring. These cost 10 and 12½ cents per cubic foot. Much of the cost of the buildings of the first class comes from the highly ornamental character, or the use of expensive cut stone work, and, judging from these buildings, it is safe to estimate that a good brick fireproof office or mercantile building can be built for not over 25 cents per cubic foot.

THE government, however, from these tables, appears to be paying 30 cents per cubic foot for a 12½-cent building. It is getting nothing but wooden floors, while buildings privately built are made fireproof for five cents less per cubic foot. In first-class buildings it pays 60 cents against plain, ordinary people's 37 cents. It now looks as though Mr. Burnham's blunt letter to Mr. Carlisle had caused that gentleman, who is supposed to guard the money interests of the country, to continue not only paying twice what ordinary people pay, but getting atrociously bad returns for his liberal investment.

MR. CARLISLE made a mistake in considering Mr. Burnham and his associates on the committee of the A. I. A. some of those "ar*t*chitect fellows" who could be indefinitely put off. As a matter of fact, any one of that committee is probably a man of broader calibre than the honorable secretary of the treasury, and Mr. Burnham's professional career certainly proves him fully as strong a man as Mr. Carlisle. But the latter is in his castle and surrounded by political henchmen of all grades, whose general methods no member of the committee of architects could come down to. Mr. Burnham's letter has been criticised quite as freely as it has been commended. But what other course was open to him? It was quite evident nothing would be gained by submitting quietly, while, by putting the thing in plain, unvarnished fact, he did the one thing that no milder course would have accomplished: he drew the attention of the public by making an issue the newspapers would take up.

PROF. A. D. F. HAMLIN, of the Department of Architecture, Columbia College, New York, makes the interesting announcement that he will conduct a summer travelling school of architecture, limited to fifteen members, taking them to Italy early in June and returning early in October. The programme is made out especially with reference to a study of the Italian Renaissance style, and, starting from Naples, the trip will include Pompeii, Herculaneum, Capri, Rome, Spoleto, Foligno, Perugia, Arezzo, Florence, Siena, Pisa, Lucca, Pistoja, Bologna, Ferrara Padua, Venice, Vicenza, Verona, Mantua, Milan, Pavia, and Genoa. Thus, it will be seen, most of the places in Italy of any architectural interest will be visited, and such a trip with a man of Prof. Hamlin's scholarly attainments cannot fail to result beneficially to the students who go. It is with great pleasure that we call the attention of our readers to this project. Full particulars may be had by addressing Prof. Hamlin at Columbia College.

"THE BRICKBUILDER" COMPETITION FOR A CITY HOUSE.

PROGRAMME.

IT is supposed that a client has a forty-foot lot in New York City, upon which he wishes to build a fine residence, which, if he desires to sell at some future time, he may convert into two separate houses, so that they will not only sell the easier, but so sold, bring a higher price than the one large house would bring. To this end the house must be planned so that it may be convenient to use as a single house, but so that very little and inexpensive alteration would change it to two twenty-foot houses divided by a party wall. The exterior is to be of brick and terra-cotta, or wholly of terra-cotta. The cost is not limited. In planning, ten feet at the rear of the lot, which is one hundred feet deep, must be left unoccupied.

The problem is principally one of both planning and design, for to be successful it must have the appearance of a single house, and yet when divided appear equally good in design as two separate houses.

The house will consist of four stories besides a basement and cellar. An elevation at one-quarter-inch scale, and a plan of each floor at one-eighth-inch scale, are the drawings required. A description of the alterations necessary to convert the house must be prepared and reasons given for the plans and the elevation adopted. The drawings are preferred flat, but when it is inconvenient to so send them they may be sent in pasteboard rolls. They are to be made on white paper, imperial size, the elevation on one sheet, the plans on another, and sent, carriage paid, to the office of THE BRICKBUILDER, Room 52, 85 Water Street, Boston, Mass., on or before June 1, 1894.

PRIZES.

There will be three cash prizes; the first $100, the second $50, and the third $25. Three other prizes in books will be given; the first any architectural book listed at $15, the second listed at $10, and the third listed at $5.00. If there be more than six designs considered by the jury as meritorious, the authors of those not receiving prizes will be presented with a year's subscription to THE BRICKBUILDER.

The award will be made by a jury of three competent architects.

Each drawing must be marked with a motto or cypher, and a sealed envelope similarly marked, containing the full name and address of the designer, must accompany the drawings. These envelopes will not be opened until after the award is made.

The six prize drawings shall become the property of THE BRICKBUILDER, and any or all of the designs submitted will be published without further recompense to their authors.

FOR a club of fifteen subscribers the yearly price of THE BRICKBUILDER is only $1.50.

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FIREPROOFING.

THE ROOF IN FIREPROOF CONSTRUCTION.

IT is certainly gratifying to see how much interest is now felt by architects, engineers, builders, and owners in fireproof construction. The desire for something durable, that will resist the great destroying elements of time and fire, is growing, and it is now generally conceded that the most durable and reliable materials for all kinds of buildings is burned clay, and therefore in all buildings where protection of life and property is desired it is being used more than ever in this country.

Insurance statistics tell us that the loss by fire is regularly and steadily increasing at the rate of $10,000,000 a year. In the year 1893 the loss was over $160,000,000, which is over $512,000 for every working day. This does not include the loss by men thrown out of business or employment, nor the additional rates on insurance in consequence of the risk. Neither does it include the taxes necessary to keep up the fire departments in every city and town in the country to guard against the loss.

Nearly all the writers on fireproof construction refer to protecting the inside of buildings. The ceilings, floors, and between the joists are filled in with hollow clay blocks; hollow brick walls take the place of lath and plaster for partitions; iron supports and columns are encased with burned clay to keep the heat from twisting, cracking, and even melting them. In every conceivable way, clay bricks and blocks are used to prevent the fire from spreading and extending. All this is done for the inside of buildings, and it is well enough. It costs money, but it does the work. While this is done for the inside of the building, a roof is put on that offers no resistance to fire, but in many cases attracts it. The roof is the most exposed part of the building, and, next to the foundation, the most important. 29.6 per cent of the fires in 1893, and in fact an average for many years, was caused by exposure. That means that $48,000,000 of property was destroyed by fire in the year 1893 that did not originate on the premises. To guard against loss from exposure the best protection is to fireproof the outside of buildings — to put on a roof that will resist the heat. The same material that will protect the inside will protect the outside. It is fast coming to that. All will concede that the fire-clay roofing tile is the coming roof in this country, as it now is in many European countries. There are many reasons for this, but your space will only allow me to present a few of the advantages tile has over any other material for covering houses.

First. Tile is fireproof, frostproof, and waterproof. To test the fire qualities, put a well-burned tile, and a piece of the best roofing slate, on your grate. See how quick the slate will crack and fly to pieces, while the heat of no grate can crack or melt the tile. Iron of any kind left in a kiln where tile is burned will be found melted when the kiln is opened. To test its frost qualities, put a tile under the drippings of your roof, and let it freeze and thaw the whole winter. You will see the frost will have no effect on it whatever.

Second. Tile is ornamental and durable. If there is a tile roof in your city, compare it with the roofs on surrounding houses, and see how much it adds to the beauty and character of the house. The roof is the most prominent part of a handsome building, and a tile roof always attracts attention to it. There is nothing shoddy about a tile roof; it is there to stay, and it will be just as good, and look just as well, one hundred years from now as it does to-day. Tile has a history of thousands of years; no other roofing material has.

Third. Tile is a non-conductor. Place a thermometer in an attic covered with tile, and another in an attic covered with slate, and see the difference. The rooms under a tile roof are cooler in summer and warmer in winter. It neither attracts nor retains the heat or frost. You never heard of a tile roof being struck by lightning.

Fourth. Weight. The old forms of tile are heavy and cumbersome. They were made by hand, in plaster moulds, and nearly always had to be plastered together with clay or cement. The new tile is made by machinery, under heavy pressure, and is compact and light. It weighs six and one half pounds to the square foot, while slate and gravel weigh ten pounds. This difference in weight is a very important point in constructing the walls and rafters of a building.

The new machine-made tile requires no paint; it is a beautiful terra-cotta red, the most appropriate color for the roof of a handsome house. It requires no cement that cracks and breaks, and by its construction it laps and locks together so no wind can move it, and at the same time accommodates itself to the vibrations and settling of the building. In case a tile is broken a new one can be inserted without removing adjoining tiles, and its lock holds it in place.

Price is an important factor in building. The old tile, made by hand, and the Spanish tile, laid in cement, are both expensive. The new tile, made by machinery, competes very closely in cost with slate. An ordinary dwelling of ten or twelve rooms seldom requires more than forty squares to cover it. If you can get a tile roof on a house of this size for an additional cost of less than $100, it certainly should not be considered.

It is safe to say that in no branch of industry (except possibly electricity) has there been as much improvement in the last few years as in clay-working machinery, and it is to this improvement we are indebted for the interest now taken in fireproof construction. Ten years ago the ornamental brick, the hollow blocks, and other forms now used for fireproofing were unknown, or if known were impracticable on account of the skilled hand labor required to form them. Now the machinery made for clay men do the work better, and cheaper, and bring the best formed materials within reach of the builder. The architects and machine men have worked together in this improvement, the one suggesting and planning, the other putting the suggestions and plans into practical working machinery. The result is a greater variety of more compact materials, at a much cheaper cost. While this is true of brick, and fireproofing hollow ware, it is also true of roofing tile. The machine of to-day takes the place of the plaster mould, the steam dryer of the uncertain sun and wind, the closed kiln of the open top arrangement; and the result in tile is you have a compact, smooth surface, uniform in size and color, straight and true, so they fit well together and do away with plaster and cement, lighter in weight, and so reduced in cost that they are brought in close competition with the next best roofing material known. Machinery has done all this, and has enabled our best architects to predict, with absolute certainty, that tile is the coming roofing material for this country.

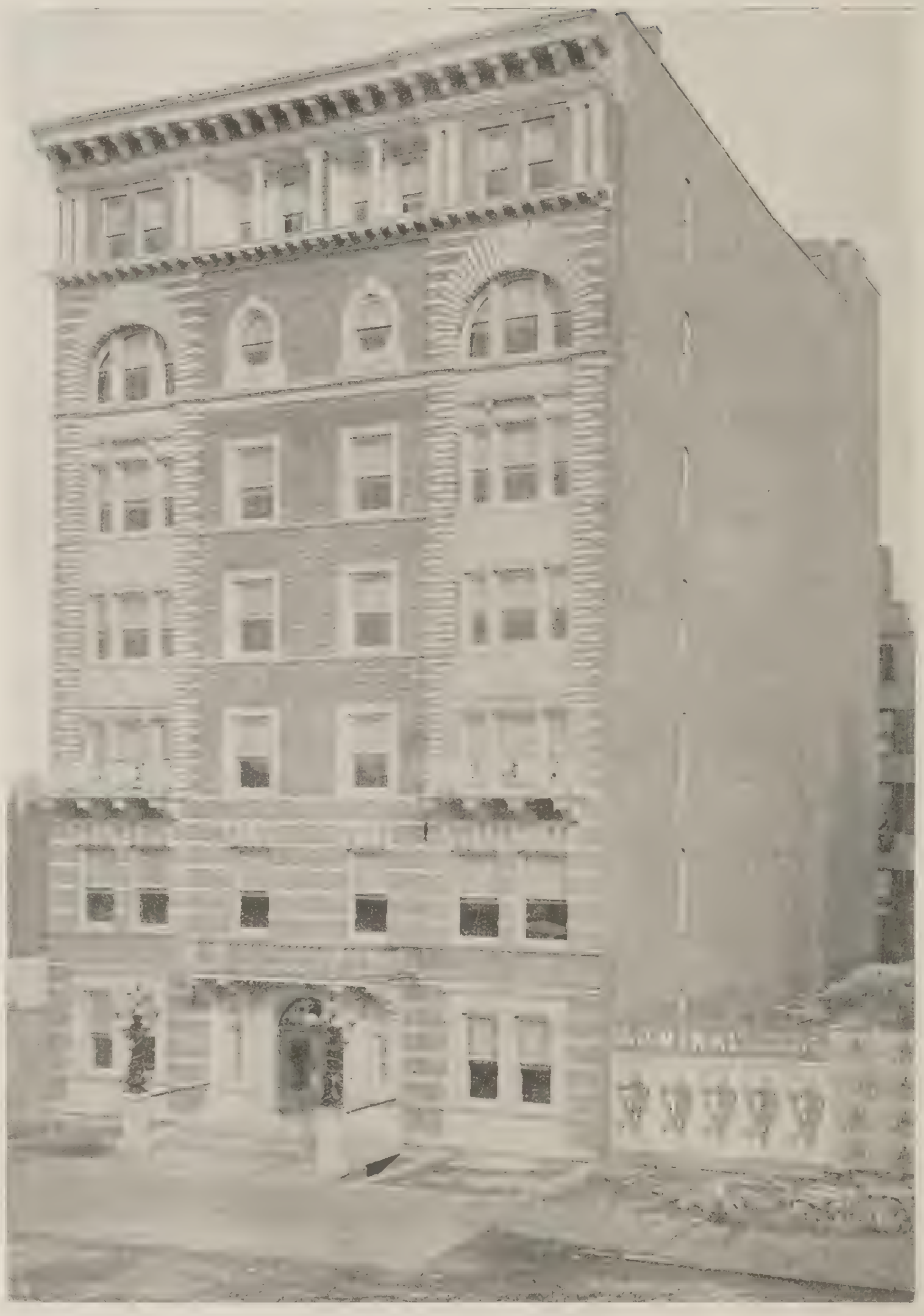
Another advantage machinery has given to the tile business is that they can be made so fast, and with so little loss, that a certain supply can be had without delay. Architects know the great difficulty and delay in the past in getting tile for their buildings. There were so few tile factories in the country, and they were always filled with orders months ahead. The Clay Shingle Company of Indianapolis now have four large factories in different parts of the country making their form of tile, and are negotiating with others, so they are able to supply any amount of tile on short notice. Before this century closes every State in the Union will have its tile factory, and all first-class buildings will have fireproof construction on their roof as well as on the inside.

John R. Elder.

Indianapolis, Ind.

THE most dangerous part of a theatre, in point of fire risk, is the stage. Here clay materials, so far, have found practically no application, nor will they ever, in all probability. To say that canvas and wood can be treated with a simple paint or liquid finish so that they will not burn, seems to most people paradoxical; yet there are at least two, and possibly more, concerns manufacturing such preparations. At the works of the Martin Process Fireproof Paint Company, in New York, we were shown by Mr. George A. Nelson several tests of canvas, mosquito netting, wood, and straw, which had been treated with their paint and other protective preparations. By subjecting the materials to continued flame, they were slowly charred, but not once did any flames start. The principal theatres in New York have scenery protected by the Martin preparations, but in Boston we question whether a single manager has taken this precaution. We understand that the New York Fireproof Paint Company, on Maiden Lane, also manufactures successful preparations. Why could not such woodwork as is absolutely necessary in fireproof buildings be so treated? The preparation may be applied as a filler, to doors, floors, window frames, etc., before they are finally finished.

WE are informed that Minneapolis is to have a plant for the manufacture of hollow brick, etc., for fireproofing. The McMullan Brick Company has been incorporated there with a capital of fifteen thousand dollars. Joseph Congdon, a prominent contractor and builder, is the president, and James McMullan secretary and treasurer. The company will develop the plant of the Minneapolis Hydraulic Pressed Brick Company.



THE SCARBORO, NEW YORK.

Fireproofing Materials: The Lorillard Brick Works Company, 92 Liberty St., New York. Ornamental Terra-Cotta: New York Architectural Terra-Cotta Company.

THE Central Congregational Church at Providence, illustrated on pages 61 and 62 of this issue, is interesting in showing an application of the Guastavino method of fireproof construction to dome and vault construction.

CASS GILBERT, Endicott Building, St. Paul, will advertise this month for bids on the Armoury Building, at Shattock School, Faribault, to be a fireproof building, with five-inch segment arches, partitions, and furring of hollow tile. Red pressed brick for outside walls. Estimated cost, seventy-five thousand dollars.

THERE will be erected in Philadelphia, on the corner of 15th and Market Streets, by Mr. Alfred Harrison, a twelve-story hotel, which is to be strictly fireproof throughout. The building will be entirely of terra-cotta, there being no bricks used at all, except possibly for the fire-escape tower. It will be a steel-frame building, every particle of the steel covered and protected by terra-cotta. The body of the walls will be of hollow cubes of terra-cotta extending through the entire thickness of the walls, modelled on the exterior to the required design, and scored on the inside to receive the plaster, which will be applied directly to the terra-cotta, and be of a quality that will resist the action of fire and water. There will be no wood floors nor stairways; in fact, everything which can be made of fireproof material will be so.

The building, as before mentioned, will be twelve stories in height, and be in the French Rennaissance style, very highly ornamented, and will contain all the modern improvements. Experiments are now being made by the architects, Messrs. Cope & Stewardson, and their engineer, Mr. Furber, in order to determine what kind of partitions will be most thoroughly fire and sound proof, with particular reference to the latter requirement. The drawings are now being made and the work of erection will begin about June 1.

LIMES AND CEMENTS,
MORTARS AND MORTAR COLORS.

AMERICAN PORTLAND CEMENT.

THE manufacture of high-grade Portland cement in the United States is really a new industry. For many years so-called Portland cement has been made in small quantities in Pennsylvania, but up to within three years a cement has not been made in this country that could compare in quality to the highest brands of German and French Portland cements. While we possess raw material in Pennsylvania and New Jersey much superior to the raw material found in Europe, it has been only recently that several American manufacturers, by carefully studying the subject, have discovered correct methods of making cement and of using their raw material to the best advantage. With the exception of such works, built within the last three years, manufacturers are greatly handicapped by the impossibility of applying correct principles, using, as they do, crude methods of calcination and a primitive mode of grinding. To keep up with improvements, and better the quality of their product, so many radical changes would be necessary that the cost would be even greater than in building new works. The English manufacturers, too, labor under this disadvantage. The Germans, on the other hand, engaging in the manufacture of cement much later, and profiting by the knowledge and experience of the English, constructed their works in accordance with correct principles. It may be, also, that the Germans, of a more scientific and technical turn of mind than the English, discovered details in the manufacture of Portland cement unknown to the latter. At all events, it stands as a fact, that English Portland cements in general are not to be classified with German Portland cements; there is a radical difference between the two. The English cements are coarsely ground, quick-setting, low in lime, and consequently not so strong; whereas the German cements are as a rule finely ground, slow-setting, and high in lime. These differences mean a great deal, both as to economy and strength in works of construction, as will be explained hereafter. On account of the superiority of German cements, doing so much more, better, and safer work, their price, as well as the demand for them, has increased, whereas the opposite is the case with English cements.

In the United States, there is an immense field for the manufacture of high-grade Portland cement, if the German methods are followed in every detail. The material found in the United States, especially in certain parts of Pennsylvania and New Jersey, is certainly superior to any yet discovered in Europe. At Whitaker, N. J., three miles east of Phillipsburg, on the Lehigh Valley Railroad, and sixty-four miles from New York, the cement rock deposit is very extensive. This rock is a slate marl, the analysis of which is as follows: —

Silica	14.44 per cent.
Alumina Sesquioxide of Iron	5.91 " "
Carbonate of Lime	75.17 " "
Carbonate of Magnesia	.77 " "

This deposit of rock was bored in several places to a depth of two hundred feet, with no change in the character of the rock, or in the analysis, and from a number of borings in various parts of the deposit the analysis of the rock averaged the same within a half of one per cent. Nature could not be more kind in her gifts to man, than in this Whitaker deposit. It is impossible to find a material more adapted to the manufacture of the highest grade of Portland cement. The constituents of the rock are just in the proper amount and quantity to manufacture such a cement. This facilitates the process of manufacture, and guarantees the uniformity of the finished product, for it is not necessary, as it is elsewhere, to add lime to the raw material to get the proper proportions of component parts in the cement. The cement rock deposit of Pennsylvania runs low in lime, and to keep the finished product up to the proper amount of lime it is necessary to add limestone to the cement rock. It is a well-established fact that the limestones of Pennsylvania possess more or less magnesia; this, in quantities of over three per cent in the finished product, is exceedingly detrimental to the stability of Portland cement, causing disintegration. It is what a manufacturer abhors. In quantities of less than three per cent it does not affect in any way the quality of the cement. Even in the best limestone quarries it is difficult to separate stone running low in magnesia from that running high, and manufacturers who use limestone in connection with their rock cannot make as uniform cement as those who do not have to add the limestone. At Whitaker it never has been and never will be necessary to add limestone to the cement rock.

Possessing the proper material is a very great advantage, and, in fact, it is the basis of success; but it is not everything that is required to make the best cement. There are various processes of manufacturing Portland cement. The old method, or the "lime kiln" process, is very imperfect; yet considerable cement in Europe, and almost all in England, is made in this way, the kiln being an improvement on the lime kiln, but on the same principle. The Germans, however, have adopted the Portland draw kiln based on the Hoffman principle, which has produced most excellent results, and which is adapted to their raw material. Most of our domestic Portland cements are made with what is really a lime kiln, — improved, it is true, by increasing the height of the stack, making it more solid, giving it a better lining, etc., but the same in principle.

In manufacturing cement by this process the manufacturer first quarries his rock, adds chalk or lime in proportions, and grinds it as fine as possible. It is then placed in a pug mill and thoroughly mixed. This mixture is then made into a very stiff paste and moulded into bricks, which are dried artificially and then placed in the kiln, first a layer of coke and then a layer of bricks, and so on until the kiln is full. The contents are ignited and left to burn for a period of ten or more days, at the end of which time the contents are drawn out, coming from the kiln in a mixture. In brick manufacturing on the same principle it is well known that the light-burned brick are towards the side of the kiln, where the heat was less intense, and consequently brick throughout a kiln of this kind vary in color, hardness, density, etc., according to the position they occupied in the kiln. It is the same in the manufacture of cement; the properly burned clinkers are in the centre of the kiln, where the heat is the highest, and the under-burned stuff lies towards the walls of the kiln. When the contents are drawn it is necessary for men to pick out the properly burned clinkers, which are ground for the finished product of the highest quality. The under-burned stuff is usually ground, barreled, and sold for a second or third grade cement, and sometimes worked over again and reburnt. The effect of this process on the quality of the cement is very evident. First, it is impossible to separate all the under-burnt stuff from the good clinkers; more or less of it *will* get in. These properly burned clinkers are in themselves all very large, sometimes as large as a barrel, and, being so large, considerable underburnt stuff is distributed throughout them. The effect of this underburnt stuff on the finished product is very detrimental. It contains the same amount of lime as the properly burned clinkers do, and as the object of calcination is to combine all the lime and silica and alumina, the more under-burnt stuff there is in the finished product, the more free lime there is in the cement, and consequently the weaker and more unsafe it is. While under this process one barrel of cement may be very good, another may be very bad; there is no uniformity.

Another disadvantage connected with this process is the inability to reach the high heat required to combine three parts of lime to one of silica. The best Portland cements show about sixty-two to sixty-three per cent of lime and twenty-one per cent of silica in the finished product, and the more perfectly the above amounts of lime and silica are combined, the greater the strength of the cement and the safer it is. This combination requires from three thousand to three thousand five hundred degrees of heat, and in a lime-kiln process it cannot be attained. Therefore those who use this process very generally decrease the amount of lime, and as the lime is decreased in the raw material the heat must be lessened, the principle being, the higher the lime, the higher the heat. Most American Portland cements are made by this process, and architects and engineers have looked upon them as unreliable and not uniform, they have so often tried them and found this to be the case. While the manufacturer using such a process may be honest in his efforts, he cannot succeed in attaining good results, for his methods are radically opposed to such results.

When works were constructed at Whittaker, N. J., the manufacturers were well aware of this fact, and, realizing that the age is progressive and that inferior cements must eventually go, and those of the highest quality remain and be established, they determined to go even farther than the Germans and manufacture a cement which could not be surpassed in quality by any cement in the world. The Germans admit that the dry process, or making it from the raw material ground to a finely powdered state, is the correct principle; but they have not as yet discovered a process by which this principle could be applied under the conditions they have. The rotary cylinder process used at Whitaker is especially adapted to the raw material found there, whereas in Europe it would not prove a success on a basis of economy. There the raw material is too bulky and refractory. Petroleum, which is the fuel under the rotary cylinder process, is too expensive for them. Where they have experimented with this process they have made the best cement, but it cost them too much. At Whitaker it is the cheapest, best, and most reliable process that can be used. The works were built several years ago and this process put in; since then a number of improvements have been discovered and adopted, making the process more successful than ever. The following is a description of it: —

The rotary cylinder is made of wrought iron, lined with best fire brick. It is forty feet long and about five feet in diameter. It revolves on its axis, on an incline, so that the raw material enters at a point higher than where the clinkers drop out at the end of the cylinder. The rock is taken from the quarries and always carefully analyzed, although this is not actually necessary, the rock being so uniform at all times. Yet this is an extra precaution used in the case of every batch of rock. It is then ground to impalpable powder, and passed from the grinding machine to the stock box at the head of the rotary cylinder. By a conveyor it passes into the cylinder from the stock box continuously. The cylinder revolves slowly on its axis. Petroleum, mixed with air, and ignited, is forced into the other end of the cylinder. This blast is continuous and heats the cylinder to three thousand five hundred degrees. The heat is easily regulated by increasing or diminishing the supply of oil. As the powder enters the cylinder and comes in contact with the heat all the carbonic acid gas is driven off through a stack connected with the top of the cylinder, and the powder gradually passes down, moved by the revolution of the cylinder. As it proceeds it is subjected to severer heat, and, turning over and over, is all submitted to the same high uniform heat. Calcination and vitrification gradually take place, and the clinkers, forming, drop out at the end of the cylinder into a receiving chamber, where they are allowed to cool slowly, and when perfectly cool are ground to the finished product.

Under the old-style process as used in this country it takes fully ten days or more to make a barrel of Portland cement; under the rotary cylinder process it does not take over twelve hours. The advantages of the rotary cylinder process over every other process in existence are as follows: —

First. Every particle of the raw material is submitted to the same uniform heat, and consequently the clinkers coming from the cylinder are all alike in color, density, hardness, and state of vitrifaction, which results in making the finished product alike and uniform in every particular. If one barrel of cement is poor, all must be poor; if one barrel is good, all must be good, as all the clinkers are alike as they come from the cylinder.

Second. The heat is always under the full control of the manufacturer: he can lessen or increase it at his will. There is no other process in the world where this can be done so perfectly as in the rotary cylinder. Also, it is possible to attain a much greater heat than is necessary on account of being able to reach so high a heat that the lime can always be kept high in the cement, thus insuring a stronger finished product. It is for this reason that the rock at Whitaker is especially adapted to the rotary cylinder process, being high in lime and more thoroughly under a high heat.

Third. The clinkers are small in size, never larger than a bean, and consequently are uniform throughout and more easily handled and ground.

Fourth. If anything should occur to mar the quality of the cement, it can be discovered instantly and checked; whereas under the lime-kiln process it takes ten days to discover the results of a single burning.

I have tried to show why a cement manufactured under the rotary cylinder process, when proper material is used, as at Whitaker, for instance, is superior to any manufactured under any other process. I take it for granted, however, that, leaving out of the question where a Portland cement is manufactured, all engineers and architects are open to correction, and prefer to use a cement on their operations in which they have confidence and which they believe will do the best work. It must be admitted that there is a prejudice, and a very just one, against the use of American Portland cements for high engineering work for the reasons heretofore stated. It is, however, the aim of the Whitaker Cement Company to overcome this prejudice by conscientious effort, and they have certainly been very successful in whatever locality their cement has been used. Inquiry may be made why I discriminate so strongly against cements, though ordinarily good, in favor of some others. It is for this reason: There are some cements, correctly manufactured, which possess characteristics which I claim are the distinguishing features of a proper Portland cement, and which characteristics are essential to insure economy as well as stability in work. It is a fact conceded by every one that all Portland cements running from sixty-two to sixty-three per cent of lime and twenty-one per cent of silica, if hard burned, are stronger than others of lower amount of lime and lighter burnt. However, a cement running from sixty-two to sixty-three per cent of lime, and hard burnt, may have the strength, but under certain conditions not be able to manifest this strength. A cement of great strength, which is coarsely ground, will not show as great adhesive strength under scientific test as if it were finely ground. The finer a Portland cement is ground the greater are its adhesive qualities. The Portland cement of great strength, very finely ground, possesses one characteristic which distinguishes it from others not so strong or so fine. It will get its maximum strength in a much shorter time. This is nothing but ordinary common sense. The best portion of any cement is the hardest burnt portion, which is the most difficult to grind, and the impalpable portion of such cement has an intense affinity for the sand and stone in mortar and concrete. It is known that with hard-burnt cements the residue on a No. 100 sieve has no setting qualities, and if this residue were ground much finer it would set, and exhibit more strength in setting, the finer it was ground. And if all the cement were ground to impalpable powder, it would take but a very short time for it to get its maximum strength, neat. It is a decided advantage when the hardening of the mortar is not too slow, because the structure is then placed, in a short time, beyond all dangers. In the works at Whitaker, this principle in manufacture is taken into consideration, and seventy per cent is guaranteed to pass through a 200 sieve, or forty thousand holes to the square inch. This seventy per cent is practically impalpable powder. An additional guarantee that not over ten per cent residue shall remain on a No. 100 sieve is made by the Whitaker Cement Company.

It is a most difficult thing to grind hard-burned cement finely. In England ordinary burr stones are used, and as a consequence the cement is very coarsely ground. In Germany the grinding is done by more improved machinery, and is finer; but at Whitaker the clinkers are ground in steel grinding machines which require great power and endurance. As a result, the Whitaker cement is exceedingly fine, and will attain its maximum strength, neat, in a comparatively short time.

If architects and engineers would reject all cements not meeting, under the hands of a competent tester, the following tests, all American manufacturers would be forced to put out a cement insuring better and more stable work, on an economical basis. The specifications I would recommend are these: —

1. The cement, neat, must stand a minimum tensile strain of four hundred pounds to one square inch section (briquettes one day in air and six days in water).

2. The cement, three parts of sand (standard crushed, quartz being used for testing) and one of cement, must stand a minimum tensile strain of one hundred and twenty-five pounds to one square inch section (briquettes one day in air and six days in water).

3. The cement must stand the boiling test, or test for safety. The test must be made as follows: Make a thick cake of neat cement, allow it to set hard in air, twenty-four hours, then immerse it in boiling water, and keep this water up to 212° Fahr. for twenty-four hours. At the end of twenty-four hours, if the cake shows no sign of disintegrating or cracking, it has passed the boiling test.

4. The cement must pass the following test for fineness: There shall be only two per cent on a No. 50 sieve, ten per cent on a No. 100 sieve, and thirty per cent on a No. 200 sieve.

5. An experienced, capable man shall do the testing.

A cement standing, in every particular, the above specifications, is much more economical than one which does not, and I would recommend, in concreting for heavy buildings, using such a cement, the following proportions: One part cement; four parts sand (coarse, sharp, and free from all loam); seven parts broken stone (clean from all dirt). For mortars, I would use one part of cement to three parts of clean, sharp, and coarse sand, with the addition of a very little cold and thoroughly slacked lime. One part cement, four of sand, and a very little lime — just enough to give plasticity to the mortar — would give most excellent results.

Of course, in the use of large proportions of sand and broken stone in concreting, and the use of large quantities of sand in mortar, it is necessary to be most careful in the mixing. In making the concrete, it is well to use as little water as possible, and to carefully ram the concrete until it sheds water. The concrete, when set, will then harden very rapidly, using the quality of cement recommended. It is false economy to buy cheap cements and use more in the concrete or mortar. Better and more stable work would be attained, and cost less, by using larger proportions of broken stone and sand, with a high-grade cement meeting the foregoing specifications. It is highly important, to insure success, that the best quality of broken stone and sand be obtained, and that the work be done properly.

I trust this article may be read with interest by architects, engineers, and builders, and that it may induce them to recommend or use the best of Portland cements for their work, which I know they will find will give them more satisfactory and economical results.

Wm. J. Donaldson.

(*See Editor's note on following page.*)

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GUARANTEE.

1 day in air, 6 days in water, - - - - - 400 lbs.
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Neat test Per square inch.

3 parts of sand to 1 of cement.— Adhesive test.
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1 " " " 27 " " " - - - - - 175 "
Per square inch.

FINENESS.

Residue on sieve No. 50, - - - - - - - - - None.
" " " " 100, - - - - - - - - 10 per cent.
Passing through sieve No 200, - - - - - - - - 65 "

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WE think it is only fair to Mr. Donaldson, and to the cement he has done so much to bring up to its high quality, to state a fact which he has modestly omitted from his article, but which is of interest to all who have read it. Then, too, perhaps we can say it with better grace than Mr. Donaldson. The cement manufactured by the process he describes is the Alpha Portland cement, made by the Whitaker Cement Company. Mr. Donaldson, whose office is in the Betz Building, Philadelphia, is the general agent for this cement, and here in New England it is handled by James A. Davis & Co., corner State Street and Merchants' Row, Boston.

(*For further cement notes see page xii.*)

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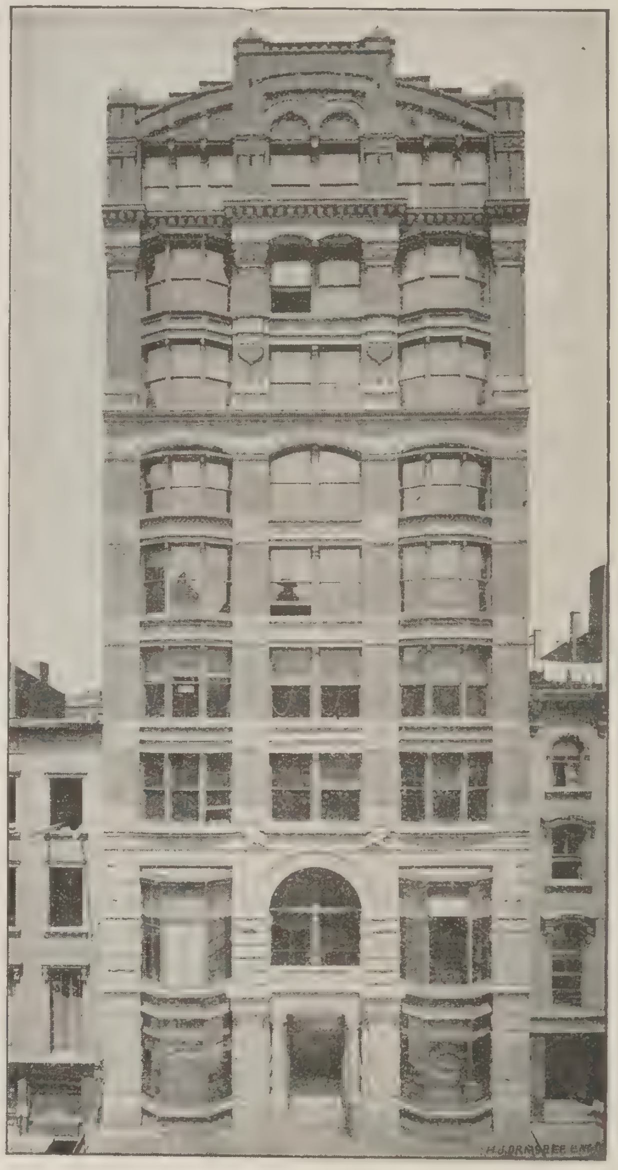

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THE MANUFACTURER.

A Department devoted to the Market Side of Clay Production.

INTRODUCTION.

THE manufacturing side of the clay-working business is already well taken care of by several periodicals. The market side, previous to the publication of The Brickbuilder, has been neglected. It is the purpose of this paper, from cover to cover, to advocate the use of clay-building materials, and, by presenting their merits in every conceivable way, induce owners, architects, and builders to use them wherever possible to the exclusion of other materials. The Brickbuilder will, in short, use every legitimate means to increase the consumption of brick, tile, and terra-cotta. Its success in this direction means more business for the manufacturer, necessitating more and better machinery, and greater dyer and kiln capacities. It means the establishing of new yards where there are none at present. We therefore expect the hearty support and co-operation of every clay-worker and every manufacturer of brickyard equipment who wishes to see a larger and more general use of clay products. The columns of this department are open to the discussion of all questions relating to the market side. Every manufacturer who has a suggestion for *selling more brick* should put it into these columns. We especially request clay-workers to subscribe to, read, and write for our paper. Its success as an advocate of architecture in clay materials directly benefits every one interested in clay-working.

TWO LETTERS.

To the Editor of The Brickbuilder: —

Sir, — The writer first wishes to congratulate you on the neat appearance, mechanical excellence, and general make-up of your publication, which will surely be appreciated by brickbuilders as well as brickmakers. If your publication causes better brickwork, the brickmaker is benefited; the more attractive we can make brick walls, the more demand there will be for them. There are two essential features necessary for a handsome brick structure: first, there must be bricks perfect in shape, uniform in color, with well-finished surfaces; second, they must be skilfully laid in the wall. To accomplish this result, there must be harmony between the brickmaker and the brickbuilders. Brickmakers have publications representing their interests, brickbuilders have their interests represented through your periodical; through these mediums the manufacturer and the builder can compare notes, which must prove mutually beneficial. The great question with both is how to increase the demand for brick for all purposes. In your article in March number you give the brickmaker sound advice, saying, "He should use every legitimate means to secure the use of brick wherever it can be substituted for other material." The builder should do likewise; he should post himself on the advantages of brick over other articles as a building material, especially over wood. A brick building is more durable; it is cooler in summer and warmer in winter, with walls properly ventilated by spaces for circulation of air between the outer and inner courses of brick; it is as dry as wood; it is in less danger from fire, hence insurance rates are less; it saves painting. These are some of the points to make in the argument for brick walls. Again, people ought to be convinced of the fact that they can have a brick wall trimmed with stone, terra-cotta, and fancy patterns of moulded brick, that cannot be surpassed for artistic beauty by any other material. Articles on the lines of that referred to in March number will result in great good to our business. We do not advertise the merits of our wares as others do in other lines.

The demand in the Southern States for well-made bricks is increasing. Most buyers want all hard bricks. This necessitates the purchase of better machinery and the construction of improved kilns for burning all hard, sound bricks. No broken or damaged bricks are sent to buildings in this section. They must be all whole. For face bricks there is a growing demand for dry-press bricks. This is being met by manufacturers putting in the best dry-press machinery. There is also considerable inquiry for roadway pavers, or annealed bricks. This demand will no doubt soon be met by enterprising brickmakers. There are now signs of increased activity in building material, which, of course, has been dull for twelve months past. Most of the large plants ship their product to market by rail.

R. B. Morrison.

Rome, Ga.

To the Editor of The Brickbuilder: —

Sir, — You have been kind to me in sending your very excellent journal, which in its line has no equal, that I am aware of. Brick building, in all its forms, principles, practice, and economic interest, is the most important industry that concerns the growth, welfare, social and pecuniary interest of our cities.

Utility, strength, health, and protection against fire are the greatest considerations. These are the factors with which you are to deal, I think, with the most special care. It is true that architectural elegance and beauty must not be overlooked, but no amount of elaborated adornment in the exterior construction of buildings will in any reasonable degree compensate for ill-proportioned buildings or walls, or inferior materials or workmanship. I have no space here to discuss this subject, and it may look like presumption for me to say that about all true principles of building up cities are either ignored or violated. If I cannot show this fact in a few short articles, I will take a "back seat," and acknowledge that I don't know what I am talking about. I trust that The Brickbuilder will take up this important subject and find more able help than I could give in its discussion.

I am very truly yours,

J. W. Crary, Sr.

Bluff Springs, Fla.

The two foregoing letters are gratifying evidences that our remarks on the market side, in last month's issue, struck home in two instances at least. Every word of Mr. Morrison's communication is solid common sense, yet there are thousands of clay-workers to whom his way of looking at the subject has never occurred. His statement that "if THE BRICKBUILDER causes better brickwork the brickmaker is benefited," only half covers the ground. We are working not only to cause *better* brickwork, but more of it. We want to see towns and villages as well as cities built of brick. We want to see brick dwellings, brick churches, brick schools, brick stables, as well as brick stores, instead of stone or frame structures. Further, we want to see brick walls replace wooden and iron fences, brick in our pavements replace cedar block, asphalt, or stone, brick sidewalks, and, in short, a brick everywhere it can satisfactorily meet the requirements of its position. We ask any brickmaker to look about him and see what might have been done in brick, but was not. Mr. Morrison says brickmakers have publications representing their interests. We want to correct this by a statement that no publication more than half represents their interests, and there is only one,— THE BRICKBUILDER, representing by far the more important portion of their interests; for we hold that the market side of any industry is the all-important side. Give an industry a market, and the processes of manufacture will be met; but without that market no process is of the slightest value. This is so self-evident, and is so clearly proven every day of history, by the shutting down of works when the demand for their goods ceases, that it seems needless to dwell upon it for a moment. But it shows that the market is the key to the whole situation. Upon it depends the operation of existing plants, and the equipment of new ones, and, consequently, every sale of brickyard machinery or equipment. To try and increase this market is the mission of THE BRICKBUILDER — to cover the portion of the brick manufacturer's business upon which depends directly every other portion covered by the journals devoted to manufacturing processes.

The increase in the market for clay goods depends largely upon the *users*, not the *makers*, of these goods. The owner who erects a building, the architect who designs it, the contractor who builds it, are the parties upon whom the selection of material depends. THE BRICKBUILDER works to increase the demand for brick by placing arguments in its favor directly before the building classes, and also by placing at the disposal of the manufacturer a weapon to use in counteracting the influence of the several papers used by wood-workers. By showing what the leading American architects are constantly doing in successfully using clay materials, through the publication of photographs, sketches, and working drawings, and by publishing examples of the best historical work in Europe, together with strong articles advocating brick and terra-cotta work, we are each month distributing, in rapidly increasing numbers, a series of convincing arguments, proving that the materials *you*, the manufacturers, produce are the best for building purposes, not only for construction pure and simple, but for artistic effect. Is such work as this not worth your co-operation? Is it not *resulting* directly to your advantage?

ORNAMENTAL BRICK WALKS.

WHEN two or three shades of brick are obtainable that are of the same hardness so that they will wear uniformly, a very handsome walk can be laid following the same class of designs so successful in tile floors. When all these colors are not of the same hardness, by selecting the hardest for the centre of the walk, which is to be kept plain, and laying the three colors to produce a border design, the wear on the sides will not be sufficient to seriously affect the walk. This especially applies to a walk from the house to the street. There is an infinite number of ways in which such a walk may be laid with the use of only two shades of brick. Such a walk, with a well-designed front wall, would be exceeding effective, in connection with a fine brick residence.

CLAY-WORKING LITERATURE.

THE importance of the clay-worker as a factor in building operations is slowly but surely being recognized. Heretofore his connections with the art of building have been in the main incidental, but within the past twenty years the few simple and somewhat crude examples of his lack of skill have been crowded to the rear, and their place supplied by a larger variety of more beautiful and useful evidences of his progress. Even the common building brick of twenty years ago has been replaced by a better-appearing and much more durable and serviceable article, and the quality of all building material manufactured from clay is constantly being improved. The science of preparing and mixing clays, unknown a comparatively few years ago, while yet in its infancy, has borne its full part in the evolution of clay-working, and no branch of the clay-working industry is receiving more careful consideration than is being given to this branch of the business. The civilization of the last half of the nineteenth century has demanded that more attention should be paid to the æsthetic, and that buildings should be erected which, without detracting from their strength, durability, or usefulness, should be more pleasing to the eye. To this demand the architects of this and previous generations have royally responded. Their efforts to satisfy the taste of the cultured of this age have taxed the resources and ingenuity of the progressive clay-worker, and to them the world owes its tribute for a class of buildings more beautiful and pleasing than those of any other country or previous era. The artistic combination of colors and shapes, which can now be produced with brick and terra-cotta in this country, is the evidence of the growth of the clay-worker's art, and will for ages be the monument of those who have aided in its development. But the student who endeavors to obtain, from the literature of the clay-worker, information to guide and direct his research, and to assist him in obtaining a technical knowledge of the art, finds his efforts completely balked. Acknowledged by all to be the oldest of the arts, the methods and processes of mixing, forming, and burning clay have for centuries been transmitted from father to son, from one artisan to another, with scarcely a written word to assist the ambitions of the earnest seeker for a better way, or to record the mistakes of his predecessor. No college or educational institute in the world has ever yet given any prominence to this art, which is still in its swaddling clothes, but which has for so long been an important factor in the world's history. Very many branches of study, a knowledge of which is absolutely necessary to the modern clay-worker, are, it is true, taught in all our colleges and universities; but the text-book which shall teach the proper application of the knowledge thus obtained, to the conversion of Mother Earth into articles of use and beauty, has not yet been published. The first works which have been written or compiled are in the main unreliable, largely because they are out of date. The development of the art has been too rapid for its historian to keep pace with it. Another, and perhaps the prime, reason for the lack of printed data on so important a subject is that within a few years the manipulation and burning of clay were considered as an avocation requiring brawn and muscle rather than an art or profession needing brains and intelligence. To-day the clay-workers, as a class, compare favorably with other manufacturers. Among them can be found many men of superior intelligence and attainments, whose practical training, added thereto, has enabled them to reap the reward they so richly deserve. The necessity for knowledge is rapidly asserting itself, and the clay-worker of the future will have a thorough practical training in chemistry, geology, and physics. He will, in addition, be a practical machinist of no mean order. Speed the day when from the public and private libraries of this country can be obtained information necessary to the success of the clay-worker. Hasten the time when an ambitious young man or woman can graduate from our high schools or colleges, with an education that will entitle them to membership in the ranks of clay-workers deserving of the name.

D. V. PURINGTON.

THE BRICKBUILDER

Vol. III. BOSTON, MAY, 1894. No. 5.

A SKETCH OF THE LITERATURE OF CLAYS.

DURING the past five years the writer has had occasion to visit, in pursuit of information concerning clays, all of the important clay districts of the United States, and has been often asked by workers in clay where they might find literature of various sorts pertaining to clays. It seems, in consequence, that a brief paper on this subject will prove of value to many readers.

Clay publications may be classified, on the basis of the points of view of the various authors, into two general groups, as follows: First, industrial publications, or those works dealing essentially with manufactured clay products and with methods of manufacture; second, scientific publications, which deal with the occurrence of clays in nature, with their chemical and physical properties, and with their behavior when subjected to a variety of conditions.

The first group is made up, as a rule, of popular publications, museum reports on collections of pottery, etc., official reports upon exhibits at expositions, scientific journals, and periodicals published essentially for the "trade." Among the popular works are many written historically, either concerning the general history of special kinds of clay ware, or dealing with clay wares in general in special localities or countries. Others are confined to artistic discussions mostly in connection with ceramics, and to a less extent with architectural effects through the use of structural materials made of clay.

The second group is embraced largely by the reports of geological surveys; the journals, bulletins, and memoirs of various scientific societies, geological, chemical, and physical; and by a large class of scientific periodicals and industrial journals. Among these publications are a few monographs devoted entirely to the subject of clays, but chapters and paragraphs, scattered often through large volumes, constitute the greater part of them. A few private publications belong to this group.

There are, of course, some works which might with equal propriety be placed in either group.

INDUSTRIAL PUBLICATIONS.

Following the order of this classification, the writer presents below brief abstracts of such publications as seem to him to be most useful to the greatest number of people interested in clay, and which are at the same time accessible in most of the large libraries of the country, or can be readily obtained through any book-dealer.

"BIBLIOGRAPHIE CERAMIQUE,"

A LIST OF WORKS ON CLAYS, CLAY MANUFACTURERS, AND CLAY PRODUCTS.

Among the books classified as industrial, by all odds the most valuable publication is the "Bibliographie Ceramique," by Champfleury. It is a French publication, and claims to contain a classified nomenclature of all the publications made in Europe, America, and in the Orient, upon ceramic arts and industries since the sixteenth century up to the date of publication (1881). This work contains a preface, and introductory remarks of seventeen pages, describing the magnitude of the task undertaken, the methods pursued, and the assistance rendered to the author by various students and writers. Following this, as Part I., is an alphabetically arranged bibliography, complete up to the date of publication, with the exception that the author left out of consideration, on account of the enormous scope involved, works touching upon prehistoric ceramics, and that of Greece and Rome.

In Part II. of the book, the alphabetical list of the first part is rearranged and grouped by countries, so that the reader can readily find, by referring to it, a work by a writer of any nationality. This work is so complete and comparatively so recent that it is hardly worth while in an article of this sort to attempt to describe any, in particular, of the great number of publications to which it refers. It is sufficient to say that any one desiring to make a study of clay industries either on the side of their manufacture, or that of art or history, should turn to it for assistance.

A PRACTICAL TREATISE ON

THE MANUFACTURE OF BRICKS, TILES, TERRA-COTTA, ETC.

In 1889 a second edition of a work by Charles T. Davis was published, which is entitled, "A Practical Treatise on the Manufacture of Bricks, Tiles, Terra-cotta, etc." The first chapter in this book is devoted to a sketch of the history of bricks, tracing it from the work of the Egyptians, between two and three thousand years before Christ, to the machine-made bricks of the present time.

The second chapter consists of general remarks upon the size, strength, and qualities of common and ornamental bricks, architectural terra-cotta, blue bricks, and the efflorescent exudation upon brickwork. The third deals with enamelling clays, ornamental bricks, tiles, earthenware, etc.

The remaining chapters are devoted to the consideration of various kinds of clays, methods of mining, washing, and marketing them, the manufacture of bricks by different processes, of descriptions of machinery, the discussion of kilns, fire-bricks, drain tiles, and sewer pipes, roofing and ornamental tiles, architectural terra-cotta, and methods of the manufacture of these various products. The book is liberally illustrated. For general and also much detailed information it is a valuable work to the manufacturers of clay products.

METHODS OF MINING CLAY.

Prof. J. C. Smock, the present State geologist of New Jersey, is the author of a paper of a few pages in Vol. III., Transactions of the American Institute of Mining Engineers, upon mining clay. He compares the method of mining by open workings in New Jersey, with those of mining by shafts and drifts, and gives a detailed account of what was, at the time of writing, a new mode of subterranean working for clays. Many of the difficult problems of mining through the clay and gravel beds of New Jersey are referred to, and much light thrown on their solution.

A GENERAL CONSIDERATION OF

BRICK PAVEMENTS.

"Brick Pavements" is the title of an article in the July number of the *School of Mines Quarterly* for the year 1891, by Werner Boecklin, Jr. This paper is briefly historical, and then passes on to the subject of clays, their preparation, and the burning and laying of the bricks. It discusses the cost and the methods of building foundations, the wear of paving bricks, their crushing strength and resistance to abrasion, and gives a table in which the relative resistance of brick and stone pavements is set forth. Their absorptive power is also dealt with, and the paper is closed with the comparison of forms of bricks and the advantages which they offer as a paving material.

FIRE-CLAY

AND ITS MANUFACTURE, MT. SAVAGE, MD.

Robert A. Cook, in Vol. XIV., Transactions of the American Institute of Mining Engineers, discusses the manufacture of fire-brick at Mount Savage, Md., one of the most important fire-clay districts in the United States. He gives a brief history of the fire-clay industry at that place, stating that it began in the year 1837, and then describes the clay bed and the methods of mining it from the earliest attempts down to the present methods. He describes the clay itself in considerable detail, gives an analysis, and enlarges on the subject of the treatment of the clay in the manufacture of brick, and the methods of moulding, pressing, drying, and firing. A description is given of a continuous rectangular gas kiln used at Mount Savage, and of the gas producer which supplies the gas. The author also devotes some space to the calculations in getting at the value of a fire-clay based on the work of Bischof, and to methods of testing the clays for different sorts of refractory bricks as carried out by the Union Mining Company, which employed Mr. Cook for making various tests, in order to keep the brick made by the company up to the highest standard demanded by the market. It is an interesting and valuable contribution.

THE FIRE-BRICK AND THE FIRE-CLAY OF SWEDEN.

In Vol. XIII. of these Transactions there is published a paper on the fire-brick and fire-clays of Sweden, which states that "the fire-clay district in Sweden is located in the northwest corner of the southern peninsula, where the material is associated with the only existing Swedish mineral coals." The development of the coal and clay has been greatly retarded by its distance of three or four hundred miles from the iron-producing centres. The paper deals with the history, geological occurrence and nature of the fire-clays, gives statistics of production and analyses. The cost, method of mining and manufacture are set forth in considerable detail. Besides its value in giving general information, the paper is a useful one to the manufacturer of fire-clay.

GENERAL DISCUSSION OF CLAYS

AND LIST OF SPECIMENS ON EXHIBITION IN THE UNITED STATES NATIONAL MUSEUM.

Frederick P. Dewey, in Bulletin XLII. of United States National Museum, 1891, has published an article on the collections in economic geology and metallurgy. On page 213 there begins a discussion of the clays, following which are tables of analyses, and one showing the wide range of application of clays, with a list of the samples of characteristic clays from different parts of the United States, which are there on exhibition.

CLAYS.

THEIR PREPARATION AND MANUFACTURE INTO VARIOUS PRODUCTS.

"Bricks and Brick-Making," is the title of a work published in 1889, by Alfred Crossley. It is a revised reprint of an article in the *Brick, Tile, and Pottery Gazette*. It is devoted to a discussion of clays and their preparation, and the making, repressing, and drying bricks. It has also a chapter on fire-clay goods and bricks for refractory purposes. It is a pamphlet of sixty pages, with numerous illustrations, well written and full of information.

REPORT ON CLAYS AND

CLAY PRODUCTS AT THE VIENNA INTERNATIONAL EXHIBITION, 1873.

There are two reports published by William P. Blake, on "Ceramic Art" and "Ceramics" respectively, of which the former is a report on pottery, porcelain, tiles, terra-cotta, and bricks, with table of marks and monograms, and notice of distribution of materials for pottery, and a chronicle of events in the history of pottery manufacture. It was first published in a volume of reports of the Massachusetts Commission to Vienna International Exhibition of 1873, and afterwards republished by Van Nostrand of New York, in 1875.

It is a remarkably interesting discussion of the clay products at that exposition, and abounds in descriptive matter, historical facts, and accounts of methods and machinery. It contains also a list of titles of works on pottery and porcelain, which were consulted by the author. As a whole, it is an exceedingly valuable treatise on the subject, but is scantily illustrated.

REPORT ON THE

CERAMIC EXHIBIT AT THE PARIS UNIVERSAL EXPOSITION, 1873,

AND DISCUSSION OF THE MANUFACTURE OF FIRE-BRICK.

The article entitled "Ceramics," by the same author, was published in Reports of U. S. Commissioners of the Paris Universal Exposition of 1878. It contains a list of the awards made, and a list of the exhibitors of the different countries. There is much descriptive text concerning the exhibits, with numerous beautiful illustrations. It concludes by quoting verbatim a paper on the manufacture of fire-brick, by James Durmachie, read at the meeting of the British Association, held at Glasgow, September, 1876. There is much in this report concerning clays and their products which is well worthy the consideration of clay manufacturers, whether they make artistic or structural products.

GEOLOGICAL SURVEY REPORTS.

The publications on clays by the different State Geological Surveys of this country have, until within the last few years, been very meagre, but are now becoming more numerous. They are usually as much "industrial" as "scientific," and so, perhaps, do not fall under he head of one of these groups more properly than the other.

THE CLAYS AND CLAY INDUSTRIES OF NEW JERSEY

AND COMPARISON OF AMERICAN WITH EUROPEAN CLAYS.

In this country the first important consideration of clays was undertaken by the State Survey of New Jersey, and a report was published n 1878 by George H. Cook, State geologist, and his assistant, John C. Smock. It is a comprehensive work of over three hundred and fifty pages, and describes exhaustively the clays and so-called kaolins and felspar deposits of the State, setting forth clearly their geographical and geological occurrence, and describing in detail the different clay beds and the specific mines and pits of the various operators in the State.

All this matter is contained in Parts I. and II. In Part III. there is a discussion of nearly fifty pages of the composition, properties, and origin of the New Jersey clays, with a table of analyses. In Part IV. the economic uses are discussed for making pottery, refractory materials, building materials, and for miscellaneous purposes. Part V. is a chapter on exploring, digging, mining, and marketing clays. In an appendix is a list of American clays examined by the Survey for comparison with those of New Jersey clays. This contains also a similar list of British, French, Belgian, and German clays. There are numerous analyses of clays, from this and other countries, and a large number from New Jersey.

It was the first valuable and instructive work of its kind published in this country.

THE CLAYS AND CLAY INDUSTRIES OF OHIO.

The Ohio Geological Survey published, in 1884, in Vol. V. of its reports, an article entitled "Economic Geology," by Edward Orton, Jr., on the clays of Ohio and the industries dependent upon them.

The first chapter is devoted to the consideration of the origin, composition, analysis, and properties of clay, and a table giving fifty-three analyses, three of which are from Ohio. The second chapter describes clay deposits of Ohio, first taking up drift clays, and then so-called bedded clays of the coal measures. Following this section is one devoted to the clay-working industries of Ohio, discussing those of pottery, stoneware, earthenware, whiteware, fire-brick retorts, glass pots, linings and tile, pressed tile and glazed tile, roofing tile, fire-proofing, pipe-making, drain pipe, sewer pipe, encaustic tiling, ornamental pottery, and terra-cotta.

EXHAUSTIVE TREATISE ON

THE CLAYS AND CLAY INDUSTRIES OF OHIO.

This same Survey, in consideration of the great importance of the clay industries in Ohio, has but recently published in Vol. II., Part I., of its reports another and more exhaustive treatise on the clays and clay industries of the State. It is in two parts; the first, which deals with the classification, composition, and origin of clays, is a concise and well-arranged article from the pen of Prof. Edward Orton, State geologist. The second part is by Edward Orton, Jr., and is devoted to the clay-working industries of Ohio. The first section of this part is entitled "A General Consideration of Clays." It deals with their origin and composition, both chemical and physical, describing in detail the various chemical and mineral impurities found, and their effects on the clay as it is treated in various ways for various purposes. Next in order is discussed properties, taking up in turn its plasticity when wet, permanence when burnt, and its refractoriness or ability to stand high and long-continued heat without fusion or loss of form.

Then follows a discussion of the changes occurring in clay by burning, which is full of points valuable to the clay manufacturer concerning the various difficulties in the way of preparing and burning the clay, the author laying great stress on the necessity of correctly burning clays. This is followed by a few pages of text concerning the testing of clays.

Section II. is devoted to the present condition of the clay-working industries of the State. It is subdivided in general into the manufacture of pottery, of paving material, of pipe and hollow goods, refractory material and building material. It is too long an article and too full of facts, ideas, and suggestions to be treated of more at length here. This report, it may be confidently said, will prove of great value to those seeking from its pages information on any of the subjects treated.

A BRIEF, GENERAL, AND HISTORICAL DISCUSSION OF

CLAYS AND KAOLINS,

WITH ESPECIAL REFERENCE TO THOSE OF CALIFORNIA, AND TREATISE ON POTTERY.

The State of California, through its State Mining Bureau, has made some contributions to the literature of clays, the best of which are to be found in two papers in the Ninth Annual Report of the State Mineralogist, published in 1890. One of them, entitled "Clays," by W. D. Johnson, chemist of the State Mining Bureau, consists of a very intelligently written discussion of clays and kaolins in general, of fire-brick and fire-clays, with especial reference to those found in California, and of a treatise on the subject of pottery. The paper is briefly historical, and then deals with the industry as it exists in California, and the clay beds on which it is founded, the author stating that at the date of writing upwards of $1,000,000 was invested in the pottery business in that State. He enlarges upon the method of treating and preparing clays in various countries, and also describes at length, in connection with tables of analyses, samples of important Japanese clays.

The other paper in this report is a very entertaining and instructive article on pottery, by Linna Irelan. It includes a classification of pottery and porcelains, and a history of some celebrated porcelain. It also treats of decoration, painting, and firing, with tables of pastes.

CLAYS AND CLAY INDUSTRIES OF MARYLAND.

Maryland, which is famous for its fire-clays, has recently published, through its Board of World's Fair Managers, a volume of some five hundred pages, in which is a chapter on the clays of the State, by Prof. G. H. Williams. It is a division of the subject of mines and minerals of Maryland. The distribution of the clays, and the clay industrial operations, embracing the manufacture of building brick, terra-cotta, and tile work, fire-brick, and pottery, are dwelt upon. The output of bricks of all kinds in Baltimore is stated to average 150,000,000 annually.

DISCUSSIONS OF

ALUMINUM ORES, CLAYS, AND BRICK PAVEMENTS.

There are several articles of interest to the clay worker and clay student in a report of the Geological Survey of Georgia, entitled "The Paleozoic Group." One of these is on aluminum ores and the sources of aluminum, including an account of bauxite, kaolin, clay, and halloysite.

Another paper is devoted to clays and brick pavements. It discusses the clays of Northwestern Georgia under the following headings: "Composition of Clays," "Kaolin Type," "Residual Clays," "Clays from Disintegrated Shales," and "Alluvial Clays," gives tables of analyses and devotes a number of pages to the consideration of brick pavements in general, and the kinds of clay required for them. It compares in an interesting way the merits and relative cost of bricks, street asphaltum, and granite blocks, as road material. There is also considerable information on the subject of clays in a chapter on the formation and characteristics of soil in the Paleozoic belt of Georgia.

A DISCUSSION OF CERTAIN MISSOURI CLAYS, AND

THE CLAY INDUSTRIES OF ST. LOUIS AND KANSAS CITY.

In the Bulletins of the present Geological Survey of Missouri, three papers dealing with the clays of different sections of the State have been published by George E. Ladd. The most useful of these is entitled "The Clay, Stone, Lime, and Sand Industries of St. Louis City and County," in Bulletin No. 3. It describes the different clays, geologically and in detail, gives a descriptive list of clay works, including those producing fire-clays, etc., sewer pipes, terra-cotta, pottery, and structural bricks. It contains a few illustrations and statistical tables.

Within the area discussed the value of the clay products for the year 1889 is shown to have been as follows: Structural brick, $2,288,795; fire-clays, sewer pipes, and pottery, $1,722,685; giving a total value for the clay and rough clay products for the city and county of St. Louis, for one year, of over $4,000,000, figures so striking as to seem worthy of insertion here.

In Bulletin No. 1, in "Notes on the Building Stones, Clays, and Sands of Certain Counties in Southeast Missouri," a few descriptive and statistical notes of the kaolin and clay industries of that region are published, and in Bulletin No. 5, an account of the clays and clay industries in the country immediately tributary to Kansas City is also published.

THE CLAY MATERIALS OF THE UNITED STATES.

The study of clays is just beginning to receive the attention which is its due in this country, and besides the reports on the subject by the different States mentioned above, there are monographs on clays either already for publication or nearly so by other States. Among these are Arkansas, Indiana, Iowa, Missouri, and Texas, and it is probable that still others, through their Geological Surveys, will soon begin special investigations concerning the clays and clay industries within their domain.

The United States Geological Survey has published, since 1882, annual statistical works entitled "Mineral Resources of the United States," which contain valuable statistical information in regard to the production, importation, and manufacture of clays. In the report of this series for the calendar year 1891, published in 1893, there is a paper by Prof. Robert T. Hill on "The Clay Materials of the United States." Following several statistical tables, the author discusses the commercial classification of clays, their origin and natural classification, and describes the sedimentary clays of the geological formations, passing from the oldest to the most recent in sequence. He then describes the occurrences of clay materials by States. The paper covers fifty-four compactly printed pages and has the best summarized statement concerning the United States clays which has appeared in print.

Among the periodicals devoted to clay and its products, published in this country, are, first, of course, this journal, THE BRICKBUILDER, which here speaks for itself, then the *Clayworker*, and the *Brick, Tile, and Terra-Cotta Gazette*, the last two being published in the West.

With this mention of periodicals the sketch of clay literature classified in a general way by the writer as "Industrial Publications" is brought to an end, and the attention of the reader is called to the second group, or "scientific publications."

CAMBRIDGE, MASS. G. E. LADD.

(*To be concluded in June number.*)

BRICK AND MARBLE IN THE MIDDLE AGES.

(*Continued.*)

CHAPTER V.

> "Am I in Italy? Is this the Mincius?
> Are these the distant turrets of Verona?
> And shall I sup where Juliet at the masque
> Saw her loved Montague, and now sleeps by him?"
> — *Rogers.*

PALAZZUOLO — COCCAGLIO — BRESCIA: NEW AND OLD CATHEDRALS — BROLETTO — CHURCHES — DONATO — DESENZANO — LAGO DI GARDA — RIVA — TRENT — VERONA.

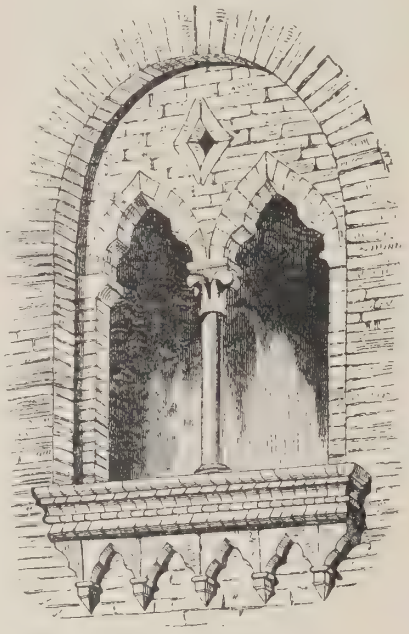
OUR drive from Bergamo to Brescia was strikingly unlike what we had hitherto been so much enjoying. Mile after mile of straight roads, between fields so closely planted with fruit-trees that one never sees more than the merest glimpse of anything beyond them, are certainly not pleasant; and the hot sun above us, and the thirsty and dry beds of rivers which we crossed on our way, made us feel glad when evening drew on, and we found ourselves rapidly nearing Brescia.

I made notes at two or three places on the way. At Palazzuolo is a great circular belfry, ornamented with a large figure at the top and divers others about its base, built of brick rusticated to look like stone, and altogether about as base a piece of architecture as could well be found, but pardoned here because of the pure blue of the sky I saw behind it, and partly on account of the view which it commands, reaching, it is said, as far as Milan, and including the great plain out of which, upon a slight hill, it rises. Palazzuolo is nicely situated, and upon the first of the many rivers which we had passed from Bergamo which had any water in its bed. The houses, too, were almost all supported on arcades, giving pleasant shelter from the sun.

Beyond this we came to Coccaglio, a small village with a wretchedly bad modern church, glorying in a glaringly sham front, and faced on the opposite side of the street by the remains of a mediæval church, whose place it has taken, and which is now shut up and rapidly going to ruin. The new church is built north and south, the old one orientating properly; but then the west front was the great feature of the new church, and therefore it was necessary, of course, to place it towards the road.

Coccaglio still has, however, some very valuable remains of mediæval domestic work in its houses, of which I was able to obtain some sketches. They were entirely executed in brick and terra-cotta, except, of course, the capitals and shafts of the windows, and appeared to be of the fourteenth century.

The upper portion of the house, of which I give a sketch (page 79), remains very fairly perfect, though its lower story has been entirely modernized. It will be seen that it is very uniform in its design, the large and small windows alternating regularly; and that semicircular arches are used in the windows in connection with ogee trefoils. This is one of the apparent inconsistencies which occur in almost all Italian Gothic work, and might seem to give us ancient authority for any amount of license in our combination of the elements of what we ordinarily consider to be thoroughly different styles. The windows are marked by the same elaboration of their sills which we noticed in the Broletto at Bergamo, and the detail of these, as also of the corbelling out from the wall of several chimney-breasts, is exceedingly good.



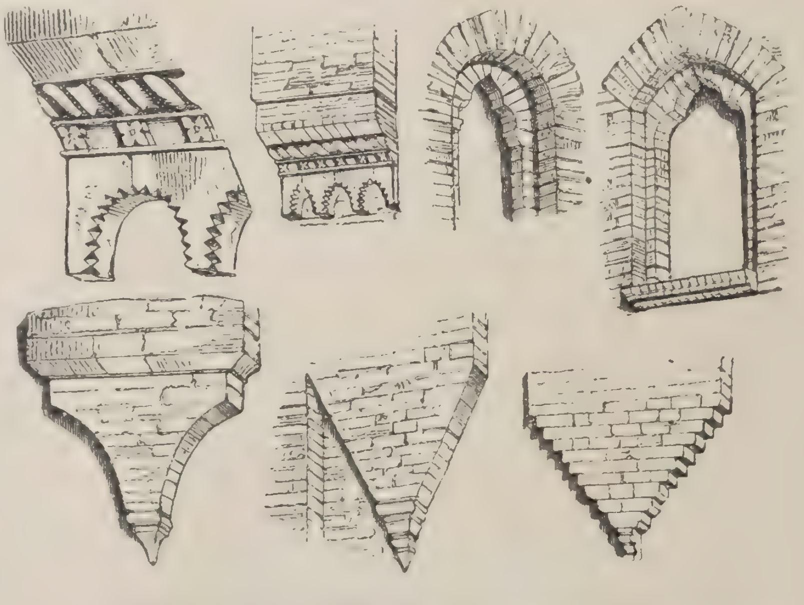
WINDOW — COCCAGLIO.

In a back street in the village I found a house, the balconies around which were corbelled forward on finely moulded beams, which, judging by the moulding, could hardly be of later date than the commencement of the fourteenth century.

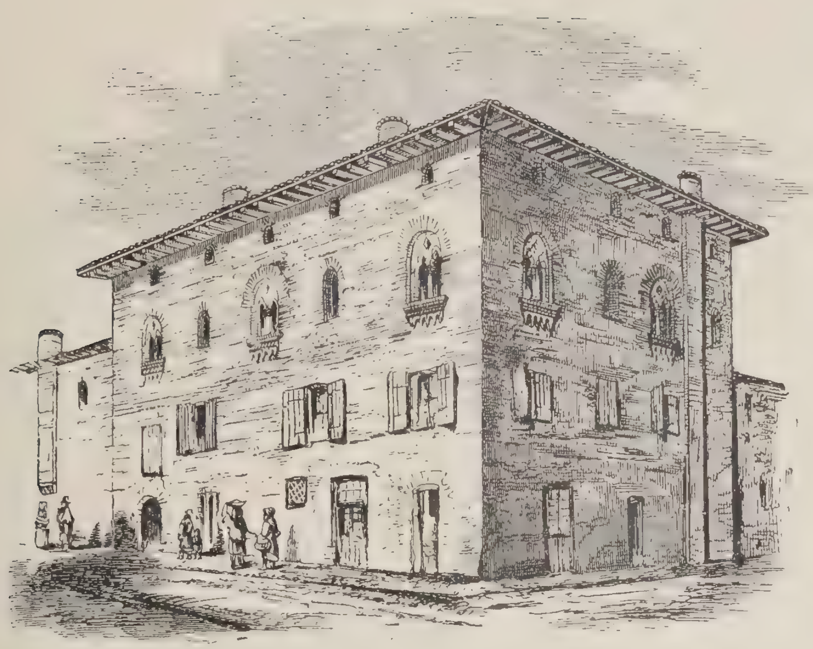
Wooden buildings of this kind are much rarer in Italy than they are in the North, and I particularly notice this little relic, therefore, which still remains to show how well the science of moulding was sometimes understood even there.

Such a village as Coccaglio is, as I found afterwards, a place to be made much of; for generally, except in public or important buildings in large towns, one sees very little trace of any mediæval domestic work beyond the perpetually recurring arcading under the houses, which is so general a feature in all the towns in the north of Italy.

There is nothing further of any interest on the road, and just after sunset we reached Brescia, too late to see anything of the general effect of the city.



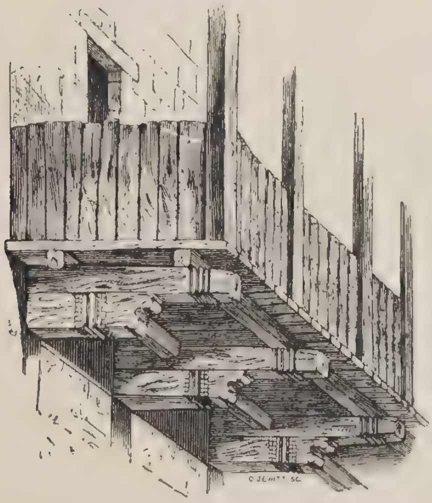
DETAIL OF WINDOWS AND CORBELLING FOR CHIMNEYS—COCCAGLIO.



HOUSE AT COCCAGLIO.

Brescia is mainly famous, I believe, first for its connection with a story of the generosity of Bayard, the "*chevalier sans peur et sans reproche*," and next for the large discoveries of Roman remains which have from time to time been made there. It is one of those towns, moreover, of which guide-books, with an immense list of churches and the pictures they contain, give, perhaps, too grand an idea before they have been seen. It is, however, undoubtedly a place of much interest, not only for the antiquary, but also for the student of mediæval art, since, though its churches are generally uninteresting, it has in the Broletto, sadly mutilated and modernized as it is, the remains of one of the most extensive and grand of these buildings, and to a considerable extent executed in very excellent brickwork.

Our first visit in the morning was to the Piazza, in which stand the two cathedrals — the old and the new — side by side, and just beyond them the front of the Broletto, stretching its great length up a slight hill and along a narrow lane beyond the Piazza, whilst at its angle, towering up between it and the cathedrals, stands a tall and rugged stone campanile, without break or window, until at the top, where, just as in the corresponding tower at Bergamo, great rudely arched openings are left, through which appear the wheels and works of the bells.

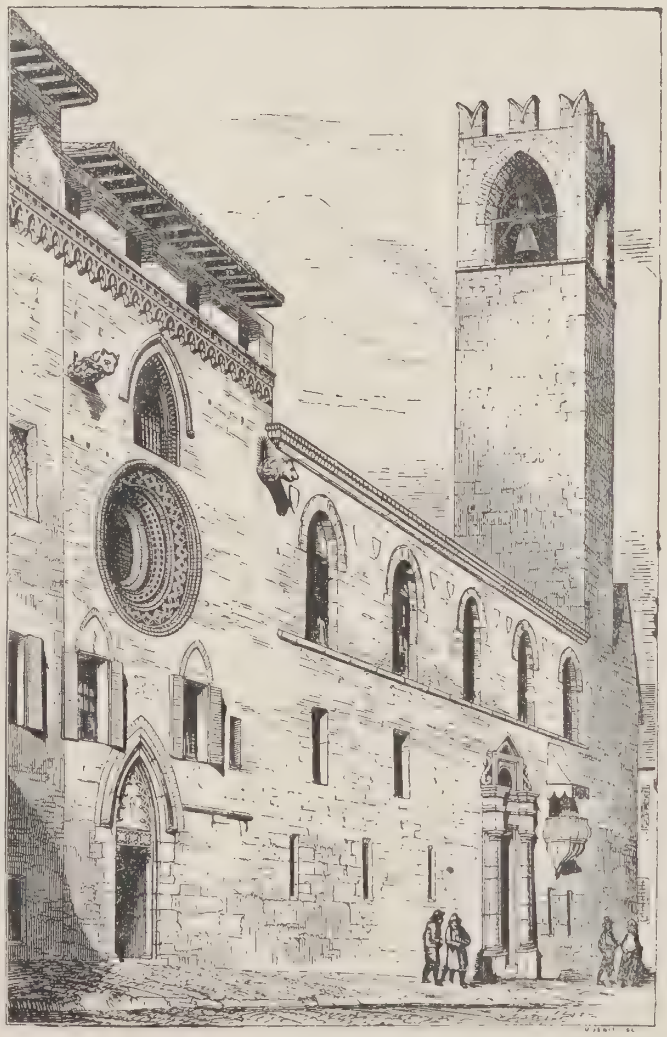


WOODEN BALCONY — COCCAGLIO.

The new cathedral, approached by a flight of steps from the Piazza, has a great sham front. It has, moreover, a large dome, said to be inferior only in size to those of St. Peter's and the cathedral at Florence, but not prepossessing in its effect; nor did the church seem to contain any pictures of value. By a descent of some twenty steps from the south transept the old cathedral is reached. This is of very early date, and constructed partly in stone and partly in brick. The most remarkable feature is the nave, which is circular in plan, with an aisle round it; the central portion, divided by eight arches from the aisles, being carried up into a dome. The choir and transepts are projected on the east side of the dome, and the former is groined and has a five-sided apse. The walls retain some fair mediæval monuments, and beneath the church is a large crypt. The old stone altar in the choir is a fine example of the thirteenth century. The mensa is, as so often is the case, carried on shafts, no less than sixteen in front and six at the ends, with carved capitals. The stalls are in the apse, and a fine lectern stands behind the altar.

The whole air of the Duomo Vecchio is chill and dismal to a degree; it is neglected and dirty, and apparently shut up except for occasional services, and left no pleasant impressions on our minds of our first Lombard cathedral; and yet undoubtedly there is both here and at Aachen — where the plan of the cathedral is so very similar — much to admire in the idea of the plan, and I can quite imagine that a very noble and useful church might in any age have been founded upon this old Lombard type.*

Those who know anything of Spanish churches will be reminded here of the two cathedrals at Salamanca, the relative positions of which are just the same, a steep flight of steps in either case leading down from the south aisle of the new cathedral into the old and deserted one.



BROLETTO, BRESCIA.

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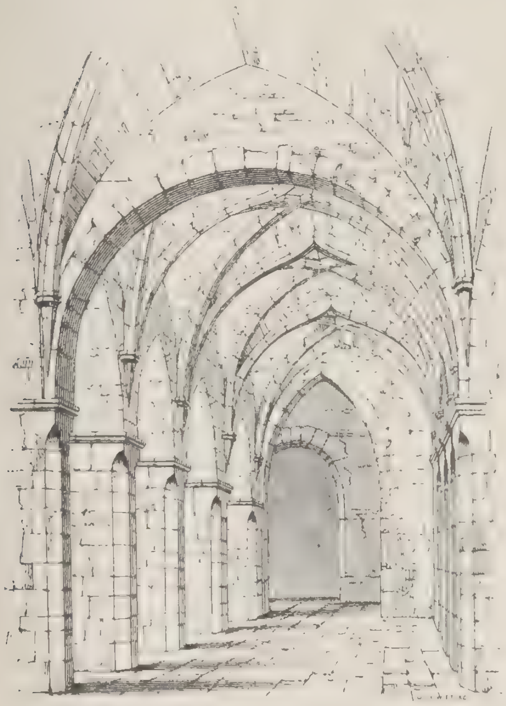
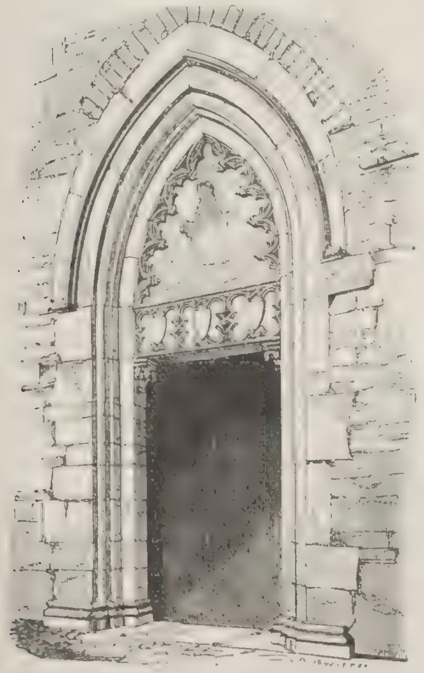
[*] S. Gereon, at Köln, is a magnificent example of a church upon the same kind of plan; a grand choir projected from a decagonal nave, the effect of which is capital. No doubt such a nave does much more than merely suggest the possibility of adapting the dome to Gothic buildings.

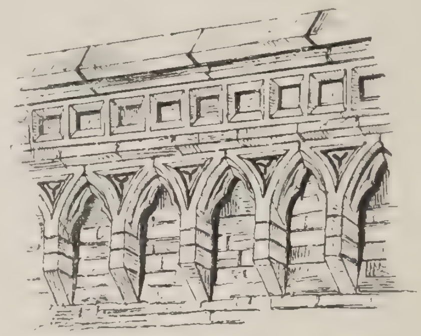
From the cathedral we went at once to the Broletto, which stands in the same Piazza. The main portion of this immense building appears to have been built rather early in the thirteenth century. The arches throughout are both round and pointed, used indifferently; but this mixture does not betoken any diversity of date, as it would in England.


CLOISTER — BROLETTO, BRESCIA.

A large quadrangle is formed by the buildings, which has a cloister on two sides, and traces of another cloister on a third side now built up. The cloister still remaining on the east side is ancient and on a large scale; it opens to the quadrangle with simple pointed arches resting upon heavy piers, and a row of piers running down the centre divides it into two portions, so that it may be judged that its size is very considerable. The groining has transverse and diagonal ribs, the former being very remarkable, and, as not unfrequently seen in good Italian work, slightly ogeed; not, that is to say, regular ogee arches, but ordinary arches with the slightest suggestion only of an ogee curve in the centre. Of the external portion of the building the west front is the most perfect, and must always have been the finest; it consists of a building containing in the upper story five windows, the centre being the largest, and possibly once the Ringheira, to the south of which rises the great belfry of rough stone, and beyond that a wide building with traces — but no more — of many of the original windows; north of the building with the five windows is a very beautiful composition executed almost entirely in finely moulded bricks; it has an exquisite door with some traces of fresco in its tympanum, executed mainly in stone, of which I give a drawing, and a magnificent brick rose window, above which is a brick cornice, which continues over the remainder of the west front and along the whole of the north side.

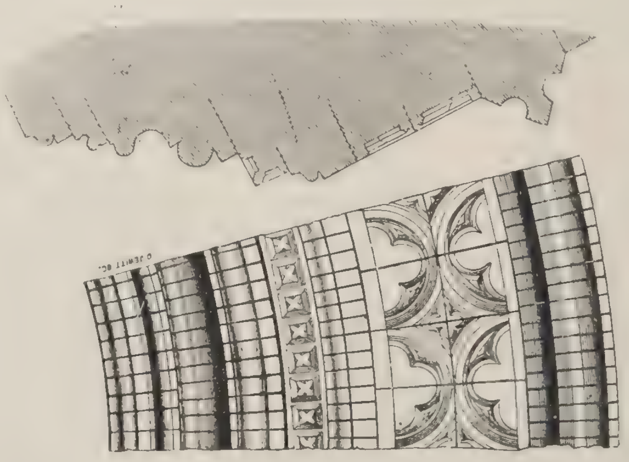

DOORWAY — BROLETTO, BRESCIA.

The size of the building is prodigious, and certainly the detail of all the parts (excepting perhaps the cornice, which is of the common arcaded kind) is most beautiful and valuable. The brickwork is so good and characteristic that I have given several sketches of it. All the arches have occasional voussoirs of stone, and the centre of the arch is always marked by a keystone, and these are sometimes slightly carved to distinguish them from the other stone voussoirs. The abaci are of brick, moulded and very varied. The doorway given in the woodcut on this page has stone jambs, caps, and bases, lintel and outer arch, the label and cusps being of terra-cotta; above this the whole of this portion of the front is of brick, and very admirably built.


BRICK CORNICE — BROLETTO, BRESCIA.

Of the churches of Brescia there seems to be but few of any interest; that of San Francesco, of whose west front I give a sketch, is the best, and, though not of uncommon design, is worth notice; the mixture of white and black marble and brick is very judicious, but I must protest once more against the arcaded eaves-cornices which are very elaborate and heavy; nor can I bring myself to like the great flat gable, covering both nave and aisles, and divided only by pilaster strips, which characterizes so many mediæval Italian churches. In this west front of San Francesco the cornices and the mouldings of the small circular windows are all of brick, and the rest of the front of stone, the rose window having voussoirs of black and white marble. The only other part of the church which appeared to be of any interest was a campanile on the south side of the choir; this had stone belfry windows, well treated with simple plate tracery, and there is a singular and lofty lantern over one of the chapels on the north side of the church, all of rich brickwork dating from about 1480.

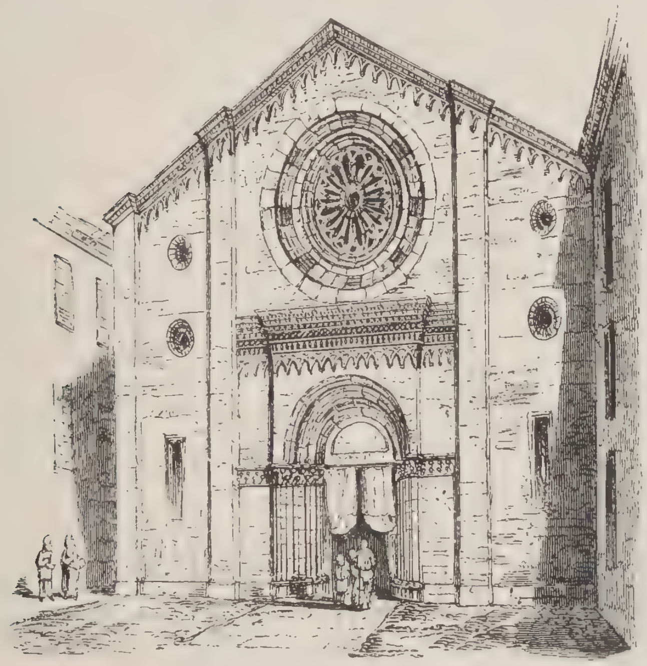
The sun was at its hottest as we wandered about the streets of Brescia; but there was so much pleasure in the examination of the busy people who thronged its narrow, tortuous streets that we enjoyed it very much. In Italian towns, too, there is not much difficulty in finding the way; we ask the road to some church, and forthwith, in place of a long and not very intelligible direction, in which we are sure entirely to confuse our right hand with our left, the person we ask turns round with us, walks by our side, shows us our object, and, politely taking off his hat and bowing, takes leave of us. It was by such aid as this that we found the church of the Carmine, which is another very late Gothic church. The west front is most fantastic and unpleasing, and the pinnacles, composed of round bricks, disposed alternately over each other, and common in most Italian brick buildings, are very ugly; there is, however, a good simple cloister attached to the church on the north; it is of the same design as almost all in this part of the world, having simple round shafts with carved caps


DETAIL OF CIRCULAR WINDOW — BROLETTO, BRESCIA.

and circular arches. An inner cloister, which I remember of old as occupied by the ever-present Austrian soldiers, is now (1872) open to all the world, and neither cared for nor used. Here the south side of the cloister is of two stories in height, the lower similar to the one just mentioned, the upper having two arches to one arch of that below, and the arches picturesquely shaped, being cinquefoils, with the central division of ogee form, and with moulded terminations to the cusps. There is a fair campanile here, with brick traceries and strings, but with a modern belfry-stage.

A little bit of cloister, or gallery, on the north side of Sta. Afra, has arcading of similar character in its upper gallery, but the arches are trefoiled.

In the Contrada della Pace there remains a very bold fragment of a castle tower. It is built of roughly jointed stone, and is perfectly plain till near the top, where it has a bold machicolation with tall square angle-turrets, the whole battlemented with a forked battlement. Out of the centre of the tower a tall, thin tower rises to some height above the battlements.


SAN FRANCESCO — BRESCIA.

One of the most picturesque spots in the city is the Piazza, at the end of which stands the Palazzo della Loggia; the effect on coming into it from the narrow streets in which we had been wandering was very pleasant, the large open space being surrounded with rather elaborate Renaissance work with rich colored sun-blinds projecting from the windows over the sunny pavement, which in its turn was thronged with people in picturesque attire selling fruit and vegetables. The streets are all arcaded, and some of them have very considerable remains of frescoes on the exterior, giving much interest to the otherwise ugly walls; they have, however, suffered very greatly from exposure, and are only in places intelligible; still they give traces of brilliant external color, and are therefore much valued in my recollections of Brescia.

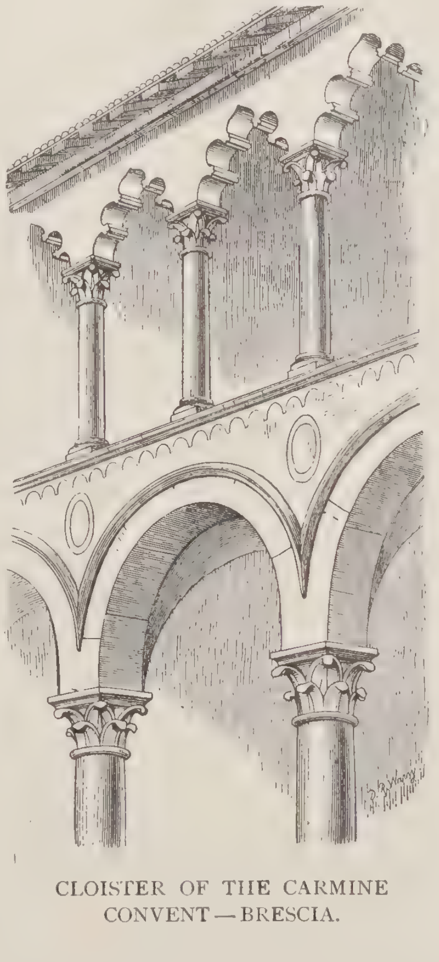
Compared with Bergamo, Brescia has the air of a smart and busy place; its streets are wider and better paved, and the smells which still greeted us were not quite so bad as there. The staple manufacture of the city seems to be that of copper vessels; shop after shop, indeed street after street, is full of coppersmiths' shops; the men all sitting at work, and keeping up a ceaseless din of hammering, in open shops, so that all the world may see them. Nor is the coppersmiths' the only trade that loves publicity, for here, as elsewhere, the barbers' shops are very amusing, quite open in front, with perhaps a yellow curtain hanging down halfway, affecting only to conceal the inviting interior, which, however, is always sufficiently visible, occupied in the centre by a chair, on which sits the customer gravely holding a soapdish to his chin whilst the barber operates; and this going on all day makes one think that shaving is, after all, one of the great works of an Italian's time!

When we left Brescia the heat was intense; the road, too, was deep in dust to an extent not to be understood in England. There had been a drought of some weeks' duration, and the much-travelled road from Milan to Verona, along which our way now lay, plainly told the tale which the dry, parched, cracked-looking earth on each side of our way, and the sad faces of every one as they talked about the failure of the vintage, amply confirmed. Unluckily for ourselves, we had not taken the advice of our driver to have a close vehicle, but had insisted upon having an open carriage, the consequence of which piece of self-will was that we had hard work, even with the aid of umbrellas, to protect ourselves from *coups de soleil.* We now learnt that in hot weather in Italy it is not always the best plan to have as much of the sun as one can get. In England it always is, but he who acts on his English experience in Italy will surely repent his mistake.

We managed, however, to exist through the clouds of dust, relieved perhaps by the sight of a regiment of swarthy and unpleasant-looking Austrian soldiers, marching through the sun and dust, many of them with their knapsacks and arms, but all with great-coats on to preserve their white uniforms. When we saw them we could not help contrasting our relative lots, and then, feeling how much worse off they were than ourselves, we went on a little more contentedly than before. The road, too, became slightly more interesting; instead of miles upon miles of straight lines, we had a more winding way, and, after a time, occasional beautiful glimpses of the mountains, which marked to us the situation of the Lago di Garda.

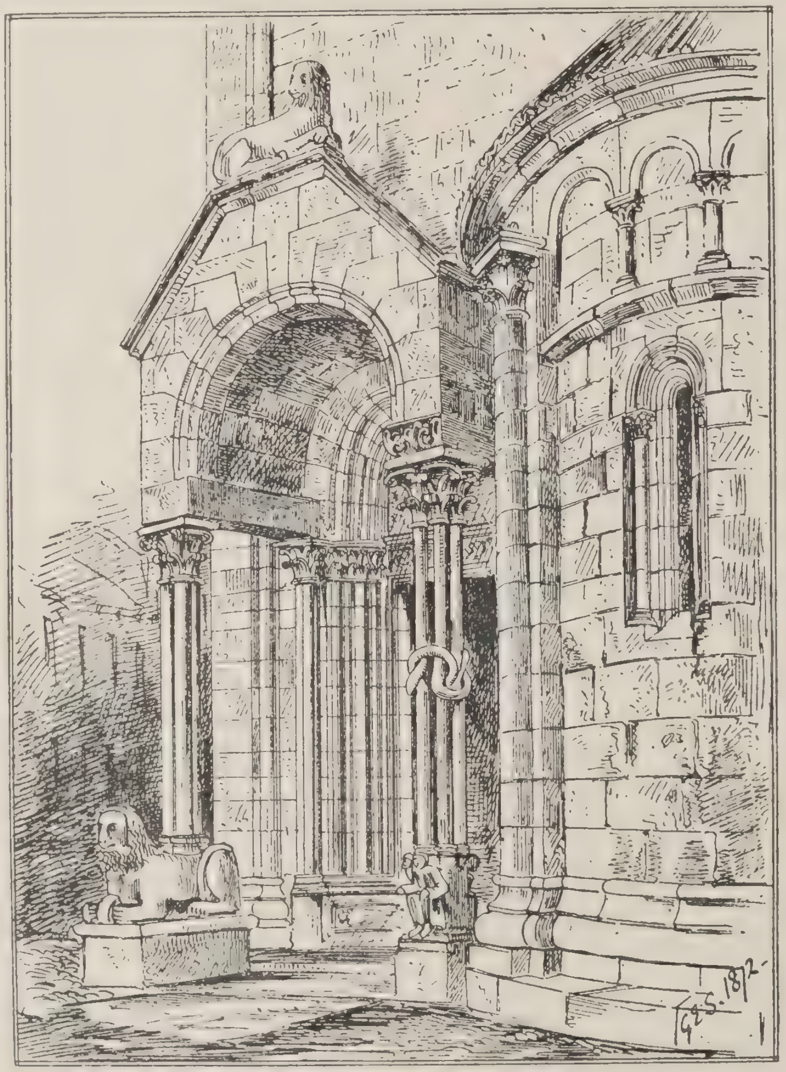
We drove without stopping through Donato, a place of no interest apparently, save for the huge dome of its church, and then passing under a very fine viaduct resting upon a long range of pointed arches (which carries the railway, which soon after our return was opened, and now whisks only too many travellers from Milan to Venice and back without a halt on the way), we commenced the descent towards the town of Desenzano, beyond and above whose roofs stretched the beautiful expanse of fair Lago di Garda, with its great calm surface, and fine group of distant mountains hemming in with picturesque and irregular outline its upper end.

We soon reached the poor and desolate streets of the town, and, diving into the dark court of the not over-clean-looking hotel, gave ourselves up for a time to the contemplation of the quiet loveliness of the scene. The contrast between the flat shores of the lower part of the lake and the mountains which crowd around its head is very striking, and to this it is that Desenzano owes all that it has of inter-


CLOISTER OF THE CARMINE CONVENT — BRESCIA.

est. We strolled out for a short time, looked at washerwomen kneeling in small tubs on the edge of the lake, and washing their linen upon the smooth face of the stones which pave its shore, and then went on, as in duty bound, to look into the church. This we found to be neither very old nor very interesting, but curious as illustrating the extent to which, in Italy, the practice is sometimes carried of putting altars in every direction without reference to their orientation. Here the high altar and some others faced due south, whilst most of the remainder faced east, and I think scarcely one turned to the west.

The remains of an old castle rise picturesquely above the little harbor, from which steamboats sail for the tour of the lake, and, bidding farewell for a time to dusty roads, let us embark on one of these for Riva, at the head of the lake, on our way to Trent, which is, artistically speaking, the northernmost really national city and cathedral in Italy.



DUOMO, TRENT.

Our steamboat kept to the west side of the lake, touching at a few villages and towns, and for the most part ploughing its way along beneath some of the highest and most precipitous rocks that I know. We took a band on board on the way, and discharged them into a big barge under a cliff, on the top of which was being held a village festa, at which they were to perform; and we all looked with no little compassion upon the heavily weighted performers as we saw the people who had preceded them climbing the steep mountain sides above us.

The Lago di Garda seems to me to be in its upper reach one of the most beautiful of Italian lakes, but it should always be taken in the way we went, for the contrast between the sublimity of the upper end and the tameness of the lower end is so great that nothing but disappointment would be felt by those who saw the head of the lake first.

One or two of the towns on the western shore have churches of some interest. At Salo there is a Gothic church with windows which have a wide external splay and an enriched brick moulding or label all round them. The windows are of one light, and have ogee-cusped heads. Another church, at (I think) Gargnano, is of much more importance. It is cruciform, with a domical lantern at the crossing. The nave has a simple clerestory and aisles, and the west end, built in black and white courses, has one great arch which encloses the doorway, above this a lancet window, and above this again a circular window without tracery.

From Riva — one of the most pleasant resting-places on the Italian lakes — a good road through fine scenery leads to Trent, a journey of some six or eight hours. The descent upon Trent is very fine. The town standing by itself well away from the fine mountains which form the background to the view, the old walls and towers around it, and the interest of the cathedral and other buildings behind them, combine to give a sense of the importance and grandeur of the city which the facts of the case hardly justify. Perhaps, too, there is something in the historical importance of the place which, without one's knowledge, sways the judgment.

There is, in fact, only one building of great architectural importance, the cathedral; but, as I shall show, it has the greatest interest, not only on account of its real merit, but also because it is a startling example of the way in which in the thirteenth century[*] the Lombard architects adhered to their old lessons and habits in spite of all the developments which were then universally accepted on the northern side of the Alps.

The church is a round-arched building throughout, but the mouldings and details everywhere show a knowledge of thirteenth century work, and have none of the character of true Romanesque or Lombard art. Yet at the same time there is in many respects a most close imitation of Lombard features. There are arcades under the cornices of the aisles, arcades under the eaves of the apses, open porches supported on shafts whose bases rest on monsters, and other features which, looked at apart from the sections of mouldings and details of sculpture, might well warrant a much earlier date being fixed on for the execution of the work than I have named. An inscription which fixes the date of some works here in 1212[†] may fairly, I think, be assumed to give the date of the greater part of the fabric, though some portions, as *e. g.* the western wheel window and the northern porch, are probably not so early by at least a hundred years. But I am not concerned to deal with the question only from an archæological point of view, and will at once therefore go on to give some description of the building.

The ground plan is in the shape of a Latin cross, with an eastern apse, two small apses to the east of the transepts, and a nave and aisles of seven bays. There is an octagonal lantern over the crossing, and the whole church is groined. The doors are, two in the east walls of the transepts, one at the west end (of marble), and one with a projecting open porch over it near the east end of the north aisle. Two western towers were intended to be built, and the staircases to them are carried up in the western and southern aisle walls in a very unusual and picturesque fashion. They commence in the third bay east of the towers, and are carried up in a continuous rise, opening to the church with a series of arches stepping up to suit the level of the staircases. The western bay to which these stairs lead is groined at a lower level, as well as at the nave level, so as to form a very lofty gallery open to the church.

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[*] I say this advisedly, though knowing very well that some German antiquaries assert this cathedral to have been built in the time of Bishop Ulrich II., A. D. 1022–1055. Those who say so must, I think, be entirely blind to all architectural detail.

[†] Anno Domini MCCXII. ultima die Februarie presidente venerabile Tridentino Epicopo Frederico de Vanga, et disponente hujus Ecclesie opus incepit et construxit magister Adam de Arognio Cumane Dioc. et circuitum ipse, sui filii, inde sui Aplatici cum appendiciis intrinsece et extrinsece istius eccelsie magisterio fabricarunt. Cujus et sue prolis hic subtus sepulcrum manet. Orate pro eis.

The clerestory consists of very small windows, and there is no triforium, the main portion of the columns goes up to and carries the groining, and, though the main arches are all semicircular, there is nevertheless an evident attempt, and it is successful, to give an impression of height to the interior. The continuous arcades under the eaves are carried also across the front of the transepts, and give a great effect of richness to the external architecture. Of the two towers only one is complete, and this was built in the sixteenth century. The northern porch is the only place in which the pointed arch appears, and it seemed to me to be of the fourteenth century, though the doorway is of Lombard character, with very quaint but poor carving in its tympanum, of Our Lord, with the four evangelists. The whole church is built of stone, and has a classical want of life and vigor, which one notices only too often in the best Lombard work. Were it not for the building attached to its northeast angle, I suspect the general impression would be much less agreeable than it is. This is a lofty erection with two square turrets and a small apse at the east, parts of which seem to be earlier than the date I have given to the cathedral. It is connected with the northeast angle, but its axis is not parallel with that of the cathedral, and there is consequently a good deal of picturesqueness in the perspective, besides which it prevents the otherwise insipid outline of the whole building being perceived.

The porch on the east side of the south transept, of which I give an illustration, is one of the most interesting portions of detail in the building. Its front is supported on two shafts, one of which is an octagon resting on the back of a lion, the other four shafts cut out of a single block and ingeniously knotted together in the centre, and resting on the shoulders of four sitting figures — altogether about as strong an illustration of mediæval love of change and variety as could be found. It must have been the work of a sculptor who was just a little savage with the somewhat tame uniformity of the whole of the architectural scheme of the cathedral.

I found little else to see in Trent. Sta. Maria Maggiore has a Romanesque steeple, quite plain below, but with its two upper stages arcaded, the arcades resting in the lower stage on shafts coupled one behind the other, and in the upper tripled in the same way. I do not remember before to have seen this last arrangement. A tower in the walls between this church and the cathedral is a rhomboid in plan, and was, I suppose, built of this strange shape to suit some necessity arising out of the position of streets and walls. Considerable portions of the walls remain; they are of stone, finished on the top with the forked Italian battlement, and having square projecting towers at short intervals.

Trent Cathedral and the fine church at Innichen in the Pusterthal are quoted frequently as the two finest churches in Tyrol. That at Innichen has not the same entirely Italian character which marks that at Trent. In the latter I always feel that climate, people, and town are all in concert to make one suppose oneself in Italy, which certainly is not the case at Innichen. North of Trent the architecture of the Tyrol (as at Botzen and Meran) is entirely German, whilst in Trent itself, were it not for a steep roof here and there covered with bright glazed tiles, and a few such slight indications, no one would suspect the presence of any German influence whatever.

I have travelled so frequently from Trent to Verona by the railway that I always regard it as one of the most natural and obvious roads of approach to Italy for Englishmen. It takes its course through so fine a country that one does not easily tire of the journey, and finally, it sets travellers down in the city which, perhaps more than any other in Northern Italy, charms the cultivated traveller by the beauty, interest, and grandeur of its buildings. Who that has taken this way to Verona does not remember with pleasure the last quarter of an hour of his journey, as the railway, making a circuit round two thirds of the city, reveals first a mixed group of lofty steeples, presently the great church of San Zenone, then Sta. Anastasia, anon San Ferno, then crosses the swift-flowing Adige, and at last lands one at the station, full of anxiety to make the nearer acquaintance of the buildings of "*Verona la degna*," which from afar look so wondrous brave and fine?

(*To be continued.*)

THE ART OF BUILDING
AMONG THE ROMANS.

Translated from the French of Auguste Choisy by

ARTHUR J. DILLON.

PART ONE.

OF ROMAN CONSTRUCTION WITH SMALL CEMENTED MATERIALS.

CHAPTER I.

METHODS OF BUILDING ROMAN MASONRY.

DURING several centuries Rome had no architecture strictly her own; the monuments of her first days were raised under the direction, and, perhaps, even by the hands of Etruscan artisans, and were but masses of rough or hewn stone laid always without mortar. When later she passed from the tutelage of the Etruscans to that of the Greeks, she changed the form but left the substance as it had been in the beginning, and up to the last century before the Christian era her builders still used the same great blocks of dry-laid stone. This method of construction, where each block evokes the idea of a difficulty overcome, was too fit an expression of Roman power to be cast aside when Rome reached the zenith of her greatness; nor was it ever entirely abandoned. The columns of granite in the monuments of the Empire, those heavy and massive monoliths that received the thrusts of the great vaults, the ponderous blocks of cut stone in the walls of the amphitheatres, and all the pompous revetments of their great edifices, clearly showed that, notwithstanding the change in style, the architects still held to the old traditions learned in the Etruscan school. But the practical mind of the Romans, their instinctive tendency towards simplification in all things, impelled them to make a more profitable use of their immense resources. Instead of composing the body of their edifices of great blocks laboriously piled up, they sought by less expensive methods to develop resources until then unknown, and they originated the general use of irregular materials broken to bits and bound together by mortar.

Whether this idea of composing monolithic masses by the agglomeration of small chips and fragments of stone is to be attributed to the Romans, or whether it is to be carried back to the Etruscans, or, like so many other inventions, even to the ancient Egyptians or Assyrians, it remains certain that never before the Roman epoch had the use of such elements been conceived of as the basis of a general system of monumental construction; the Romans first appreciated all the advantages that so simple a means offered to art; they first used it methodically, adapting it with rare sagacity to varying needs, and, profiting by the facility with which rubble of fragmentary material and mortar can be composed, even of the most diverse substances, they made its use almost universal and utilized it at all points of the Empire with almost equal success. The materials they used were confined to no one spot; the most shapeless bits of stone, splinters of hard rock least fit for cutting, the slightest fragments which to-day would be cast aside in the debris of the quarries, were sufficient for their greatest undertakings. The manual labor was the simplest; the edifices composed of a plastic material could, as it were, be modelled at the will of the architect and raised by hands most unaccustomed to the arts of building. The execution of their work required only an expenditure of force; lacking skilled masons, the slaves, the armies, the population subject to forced labor, filled the needs of the workyards, where the most difficult operations were reduced, as we shall later show, to spreading the beds of mortar and laying the fragments of stone on them in uniform courses.

I propose in this chapter to give the details of the process of making that agglomeration of mortar and small stones of which the Roman masonry was constituted. But before doing so it is necessary to mark very plainly the distinction between two sorts of masonry which resulted from two distinct and clearly characterized processes, and which have never, as far as I know, been employed indiscriminately. The distinction I wish to make clear is that which resulted from the part compression played in the construction of Roman masonry, which had, one might say, peculiar characteristics, and was used for special purposes, according to whether ramming was or was not used. We will first take up the rammed masonry, the manner of its preparation, and the circumstances which determined its use, and to make this clear, we will take, as an example, an ordinary mass of it, a straight wall, for instance, with vertical faces.

RAMMED MASONRY.

The following figure will aid in the explanation of the processes followed by the Romans in laying rammed masonry; it represents an imaginary section through a thick mass comprised between facings of large cut stones. The method was as follows: Between the stones forming the facing of the wall they spread a thick bed (ten to fifteen centimetres) of mortar, made, in Rome, of lime and puzzolana, elsewhere of lime and coarse sand. Upon this they spread with the shovel fragments of stone reduced to the size used in making modern roads, that is to say, capable of being passed through a ring of about eight or ten centimetres in diameter. When the beds of stone reached a thickness equal to or slightly greater than that of the bed of mortar, they rammed it thoroughly, with the effect of forcing the mortar into all the interstices. These layers, each bed of stone being rammed, alternated throughout the height of one course of the facing; when the top level of each course was reached, the workmen threw on the bed of small stones the dust resulting from the dressing of the facing and then rammed more thoroughly than before; the mortar under this compression found its way into all crevices, but, thanks to the presence of the dust, it was impossible for it to rise to the surface and adhere to the tools and feet of the workmen. The same series of operations, — spreading a bed of mortar, covering it with broken stone and ramming, — was continued along the line, and a mass of rubble, such as we have described, might be likened to a rammed embankment composed, however, of successive layers of mortar and small stones. Thus were built the masses of nearly all the tombs along the roads near their entrance into Rome, particularly those along the Appian Way. The material employed was sometimes fragments of compact tufa, sometimes splinters of black lava, which could be quarried at a short distance from the works. In examining these ruins, one cannot mistake the system of their construction, and, with a few exceptions, it was the system that I have described. Thus one can distinguish, in the sections of the masses, courses of mortar, and courses where the broken stone predominates; the fragments pressed together near the surfaces where the compression was applied, and here and there partially crushed by the shocks or by mutual friction, while others pierce with their sharp points the beds of mortar that hold them. Moreover the horizontal planes of compression can be so clearly distinguished that it is, I think, impossible not to recognize in the ruins the progress of a systematic ramming.

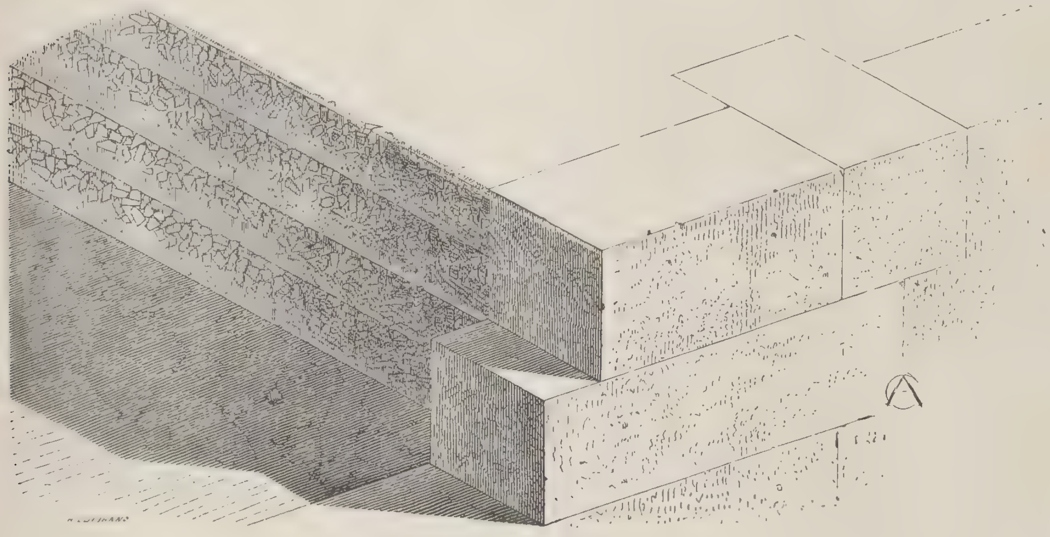
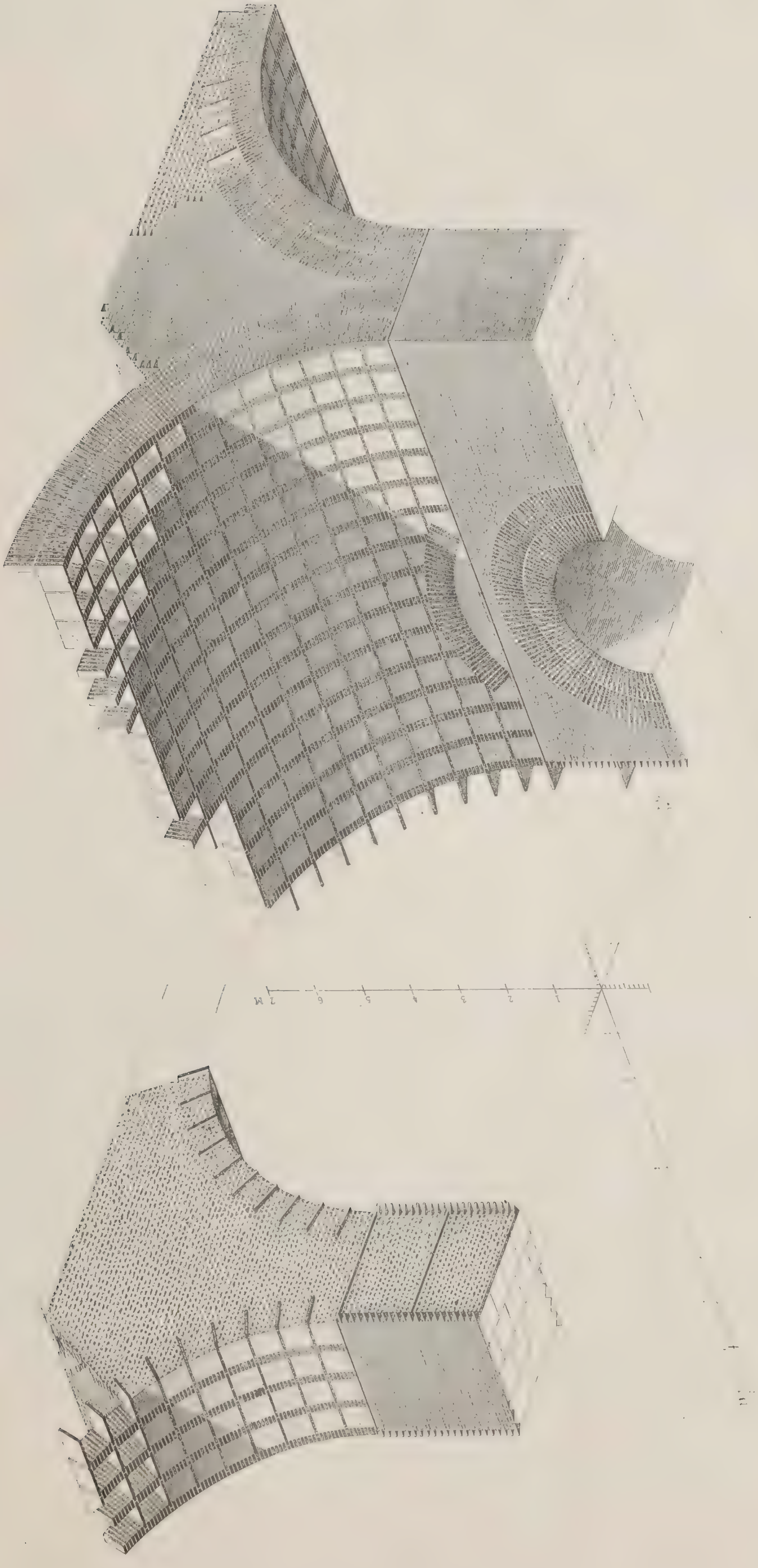


Fig. 1.

Aside from this use of tamped masonry in cores with stone reveting, the only other employment of it that I know is in the substructures of Roman edifices, and this application suggested itself naturally. The soil of the Roman Campagna is composed of volcanic products, more or less united, so that it is feasible to make the walls of excavations vertical, provided that a slight sheathing is used to maintain them. Thus the excavations themselves afforded an extremely firm mould in which the masonry could be rammed, a circumstance that the Romans put to profit in building the foundations of their principal structures; and, with few exceptions, the subterranean masonry of their monuments is composed of thick and thoroughly rammed beds of mortar.

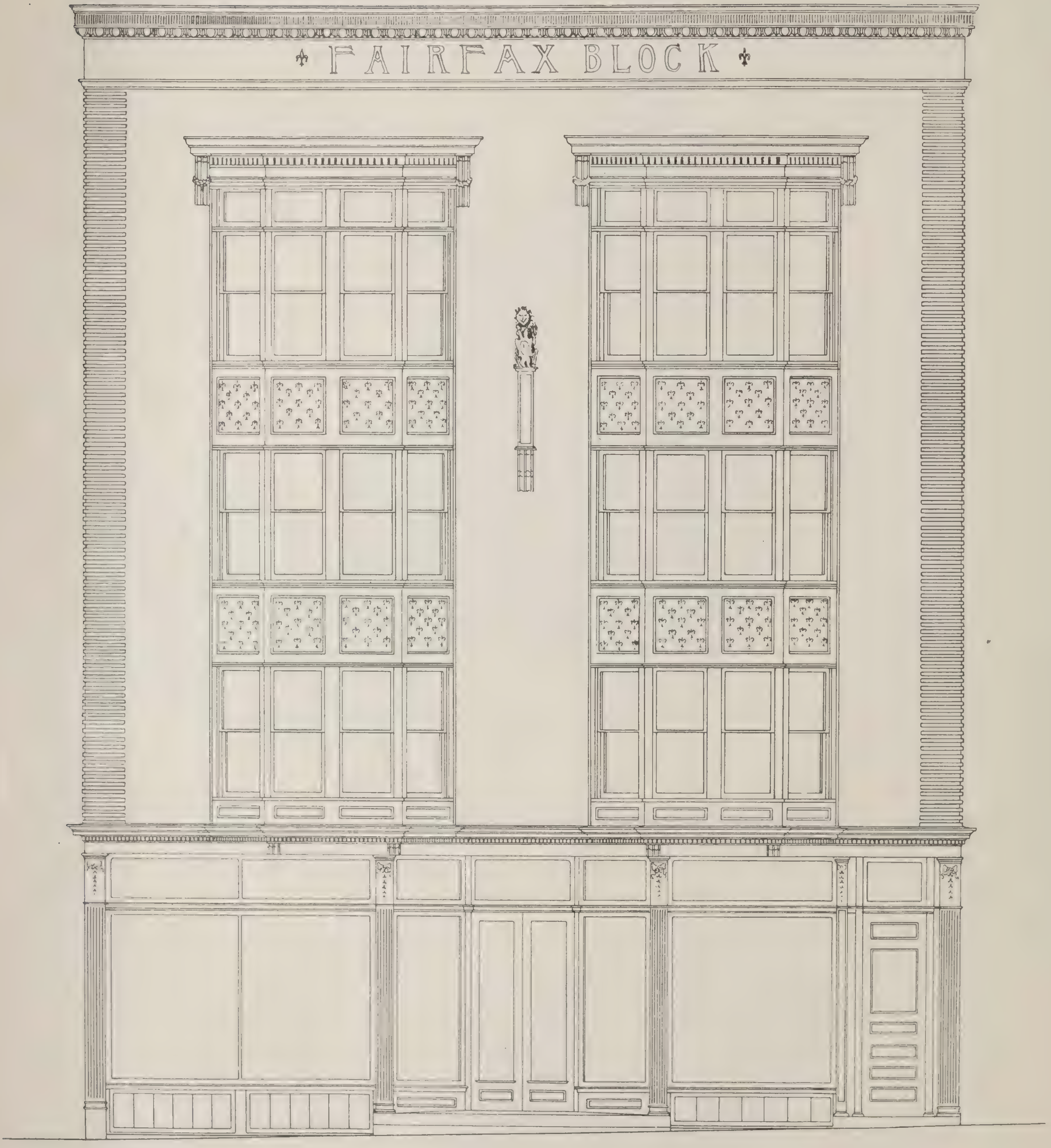
Such are the substructures of the so-called Circus of Sallust, and such, also, are the walls which now support the terrace against the Basilica of Constantine; these walls must not, however, be regarded as built expressly for retaining the earth. The walls for this purpose have fallen, leaving bare these formerly subterranean ones, which were originally nothing else than the foundations of edifices long since destroyed. Similar decay has brought into view ancient foundations in the circuit of the Palatine, which would also be taken for retaining walls, but which were in reality constructed of rammed masonry in sheathed trenches and have served to hold the earth only since the real retaining walls were overthrown. To the same system belong, at least in part, the fillings-in made by Hadrian to support the platform of the Temple of Venus and of Rome. Wherever the substructure of the platform was built beneath the surface, wherever the excavations for them afforded a natural mould, the Romans made the masonry of alternate thick beds of small stones and mortar united by compression.

Let us finally cite, as perhaps the most remarkable example of this work made by ramming in sheathed trenches, the foundations recently discovered by the excavations in the Farnese Gardens. They may be regarded as a type, and an attentive study of them would permit the restoration of the forms of the previously cited works, some of which are much defaced. I have tried in Fig. 2 to give the actual appearance of these foundations and that which they presented at the time of building. The marks of the boards and of the uprights of the sheathing are very clearly imprinted, and one has but to imagine the wood replaced in the impression to find, point for point in every detail, the arrangement of the sheathing as represented in the lower part of the drawing. The uprights against which the planks forming the revetment of the trenches leaned marked in the foundations deep vertical grooves, and the position of the planks can be distinguished by long horizontal streaks of mortar. Often the mortar forced by the ramming has penetrated



THE ART OF BUILDING AMONG THE ROMANS.

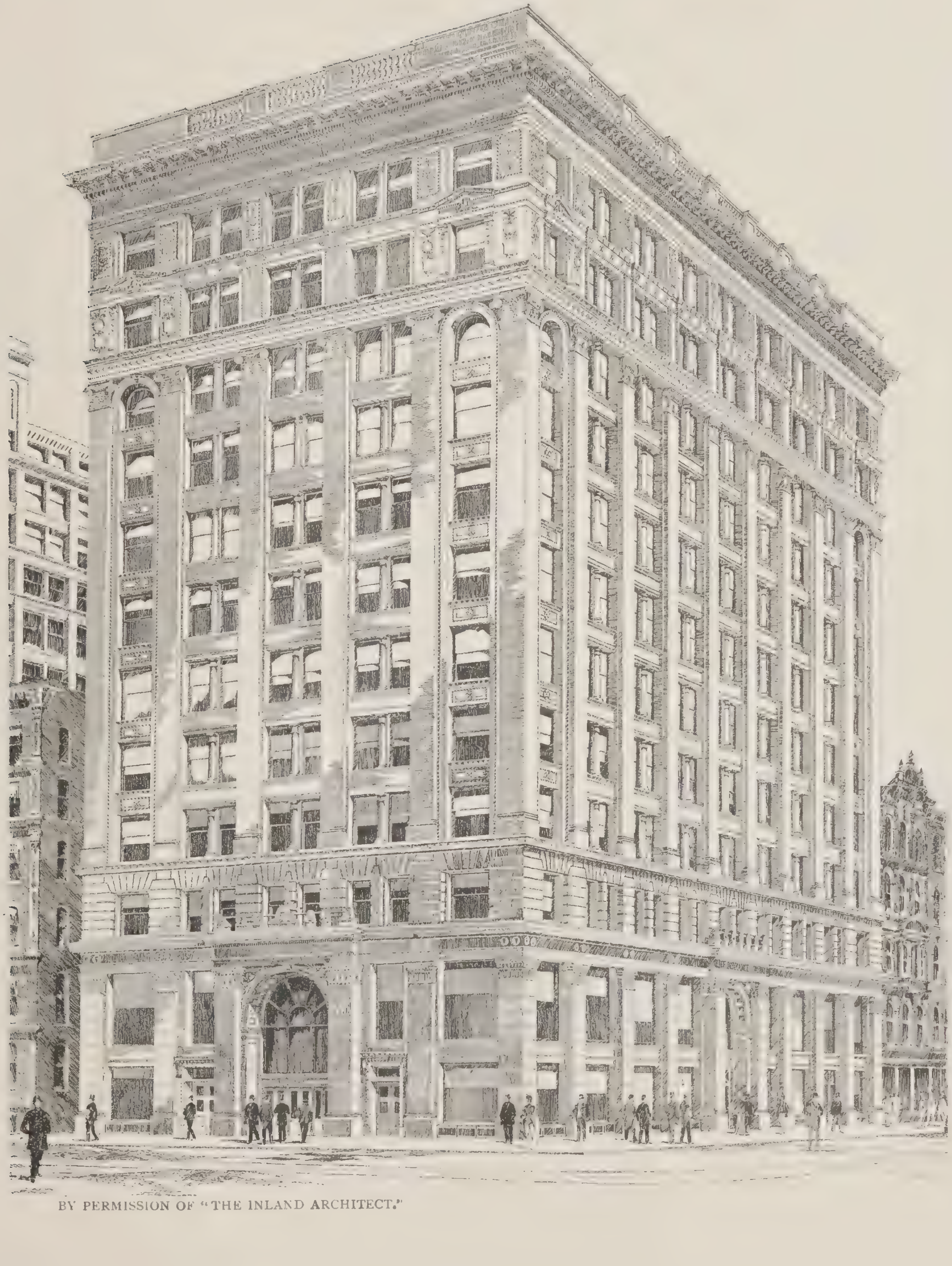
See article on page 83.



BUILDING FOR MESSRS. FAIRFAX BROS., GENEVA, N. Y.

NOLAN, NOLAN & STERN, ARCHITECTS, ROCHESTER, N. Y.

DRAWN BY J. MILLS PLATT.

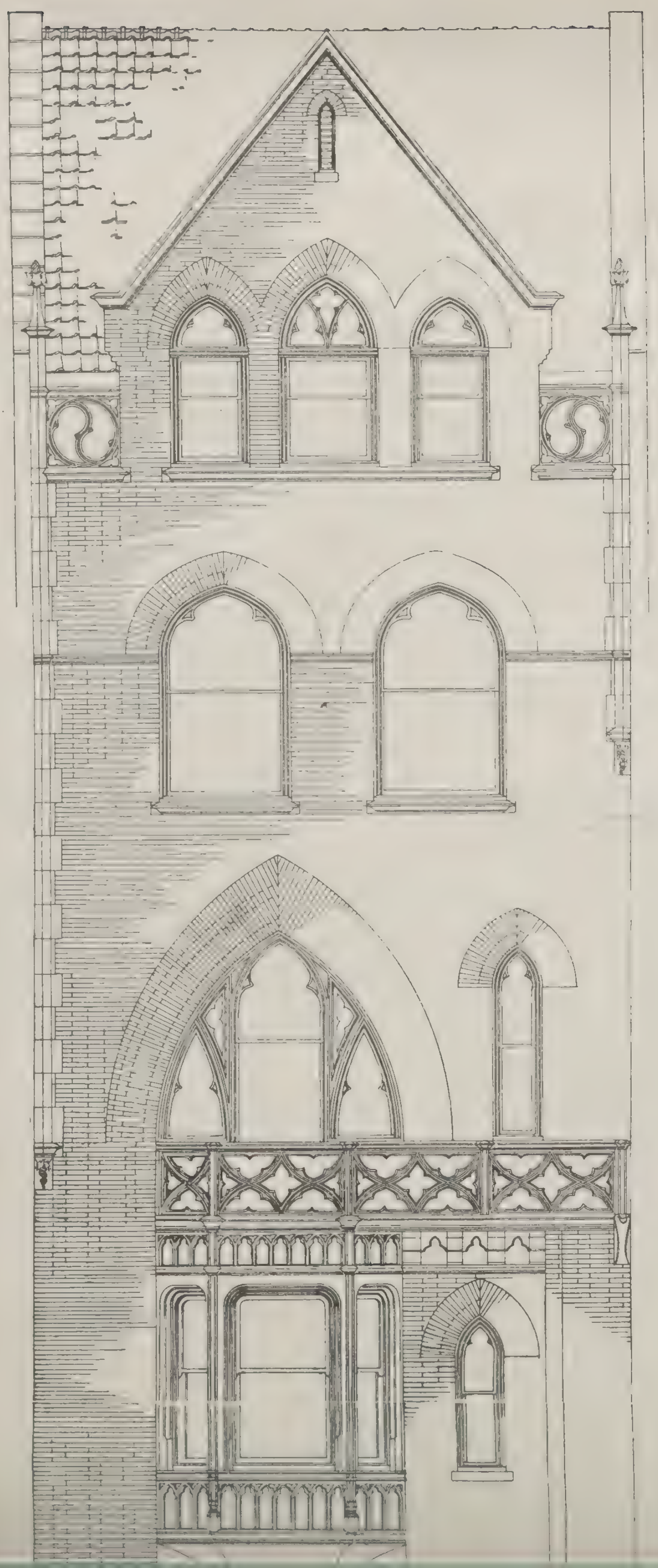


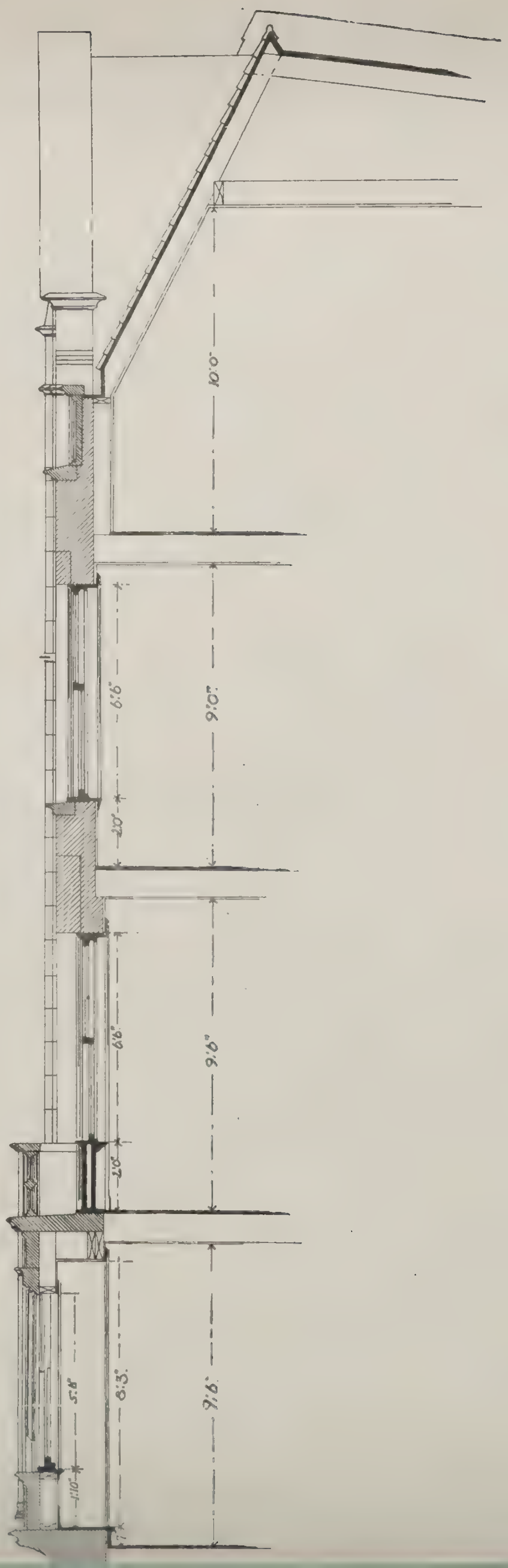
BY PERMISSION OF "THE INLAND ARCHITECT."

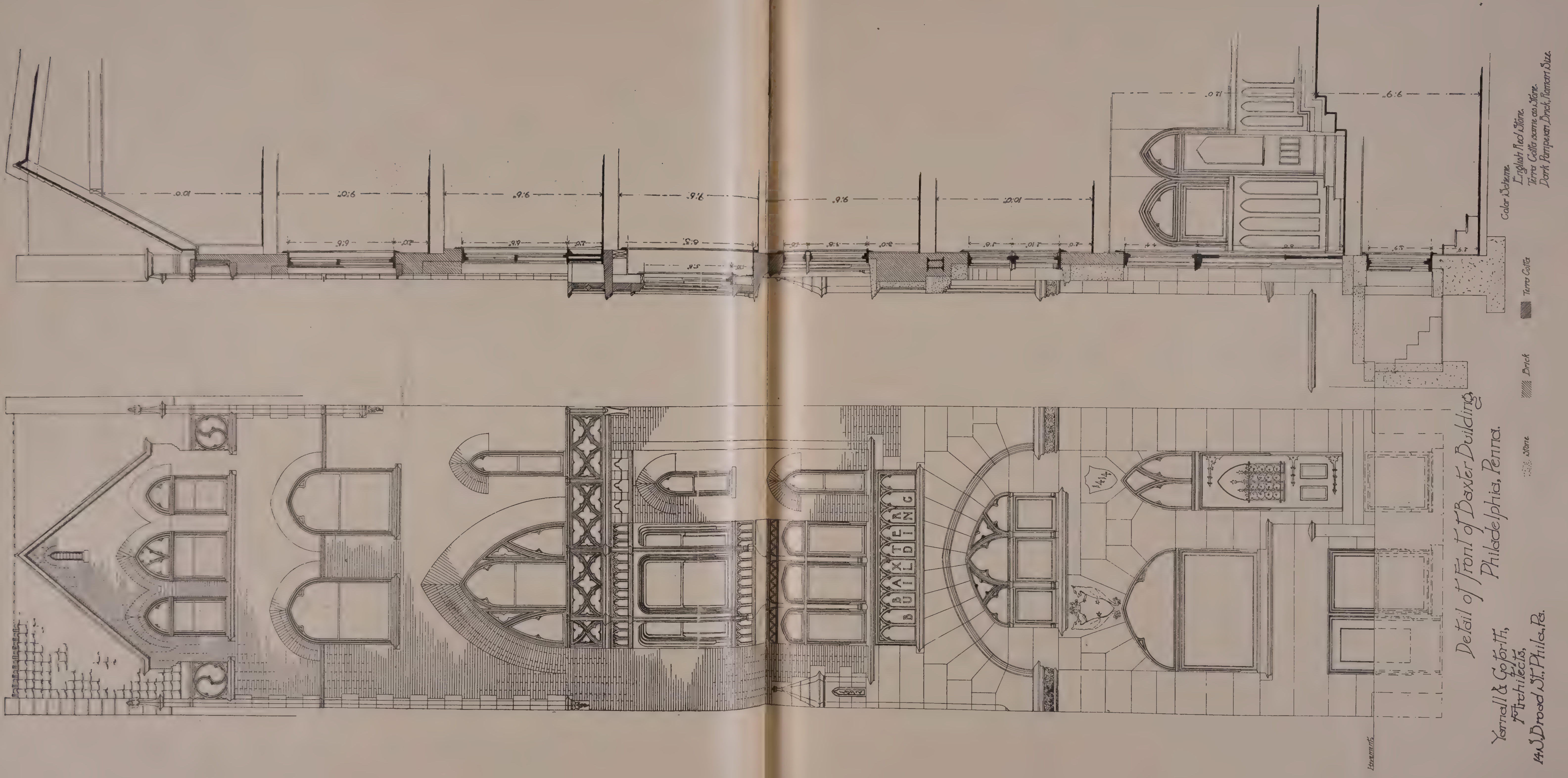
NEW YORK LIFE BUILDING, CHICAGO.

JENNEY & MUNDIE, ARCHITECTS.

See article in Fireproofing Department.

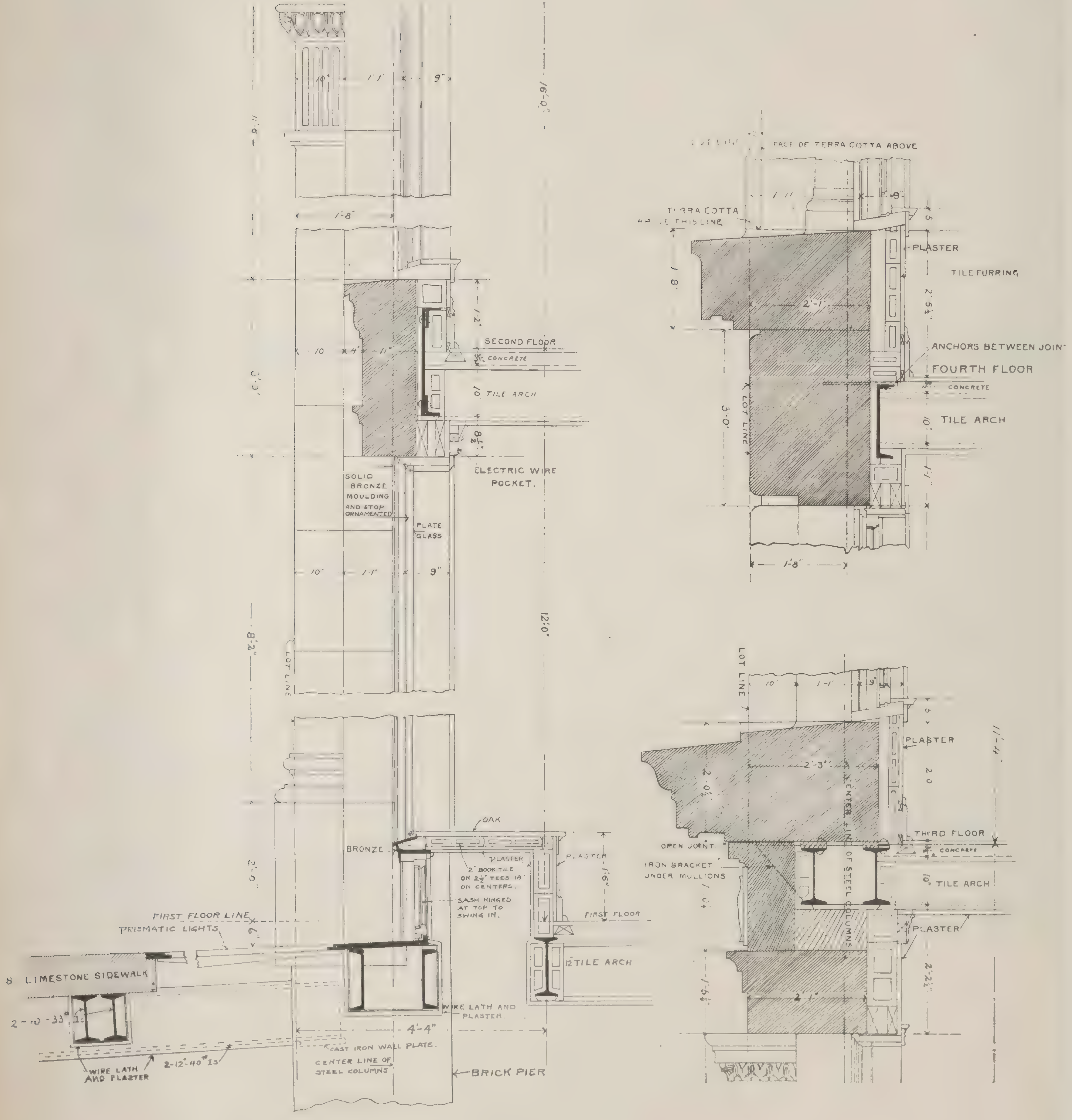



10'0"
6'6"
9'0"
2'0"
6'6"
9'6"
2'0"
5'8"
8'3"
9'6"
1'10"



Detail of Front of Baxter Building,
Philadelphia, Penna.

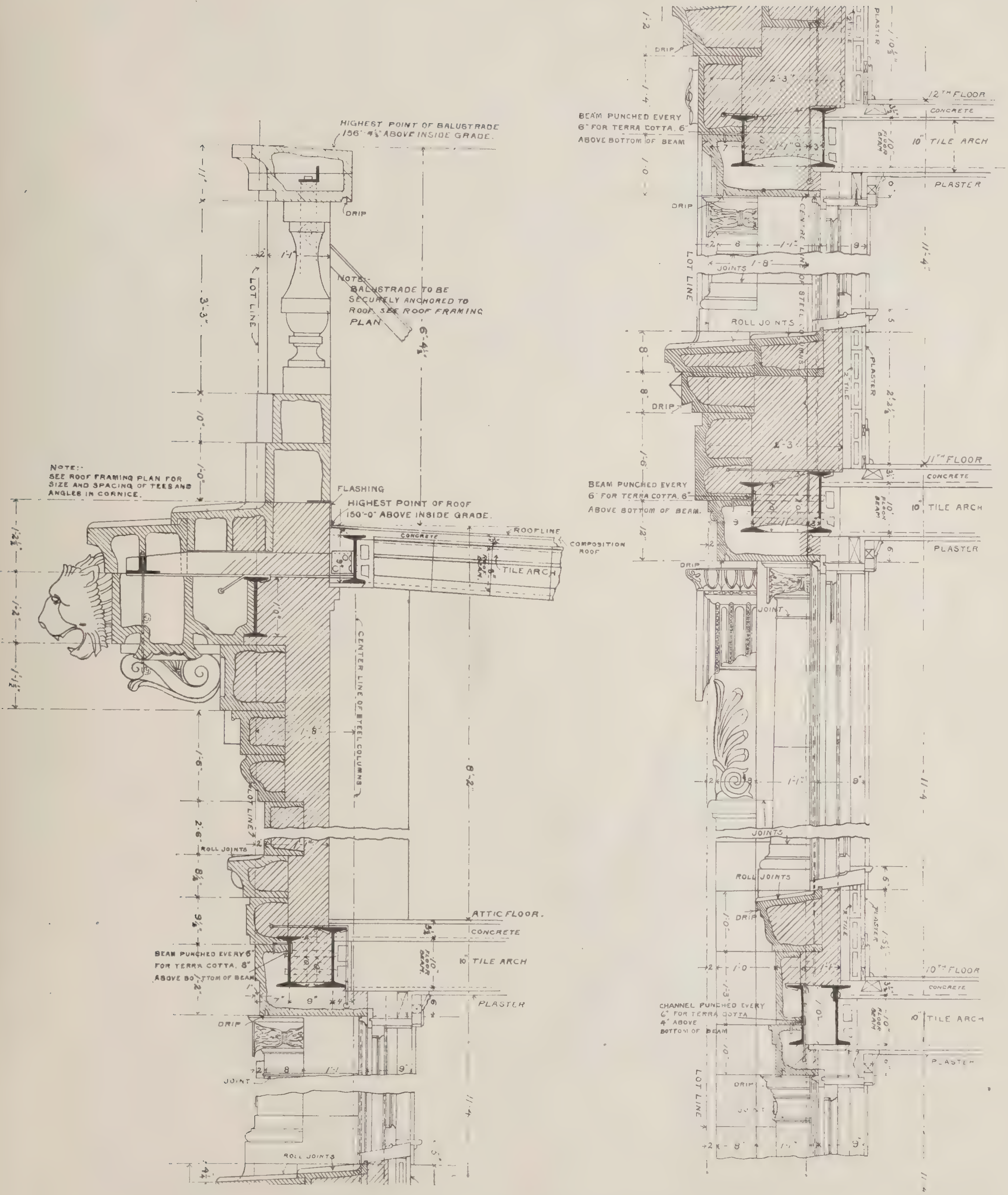
Yarnall & Goforth,
Architects,
14 S. Broad St., Phila., Pa.



SECTION THROUGH 1ST STORY STORE FRONT AND 2ND STORY BANK WINDOW IN GRANITE FACED WALLS.

DETAILS OF FIREPROOF CONSTRUCTION.

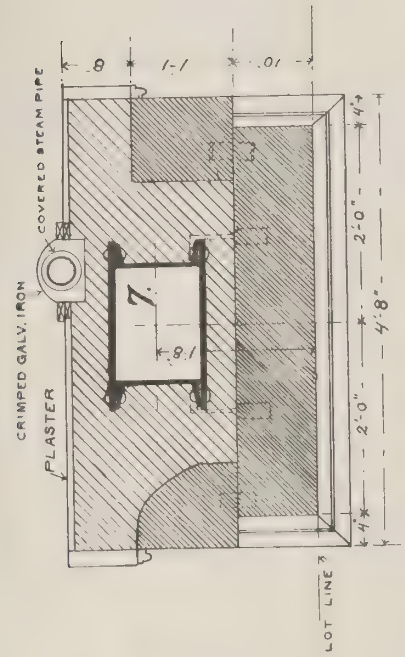
See page 91.


HIGHEST POINT OF BALUSTRADE 156'-4½" ABOVE INSIDE GRADE.
DRIP
LOT LINE
NOTE:- BALUSTRADE TO BE SECURELY ANCHORED TO ROOF. SEE ROOF FRAMING PLAN
NOTE:- SEE ROOF FRAMING PLAN FOR SIZE AND SPACING OF TEES AND ANGLES IN CORNICE.
FLASHING
HIGHEST POINT OF ROOF 150'-0" ABOVE INSIDE GRADE.
ROOFLINE
CONCRETE
COMPOSITION ROOF
TILE ARCH
CENTER LINE OF STEEL COLUMNS
ROLL JOINTS
ATTIC FLOOR.
CONCRETE
10" TILE ARCH
BEAM PUNCHED EVERY 6" FOR TERRA COTTA, 8" ABOVE BOTTOM OF BEAM
PLASTER
JOINT
12TH FLOOR
BEAM PUNCHED EVERY 6" FOR TERRA COTTA, 6" ABOVE BOTTOM OF BEAM
10" TILE ARCH
PLASTER
CENTRE LINE OF STEEL COLUMNS
JOINTS
ROLL JOINTS
11TH FLOOR
CONCRETE
10" TILE ARCH
10TH FLOOR
CHANNEL PUNCHED EVERY 6" FOR TERRA COTTA 4" ABOVE BOTTOM OF BEAM
TILE
FLOOR BEAM

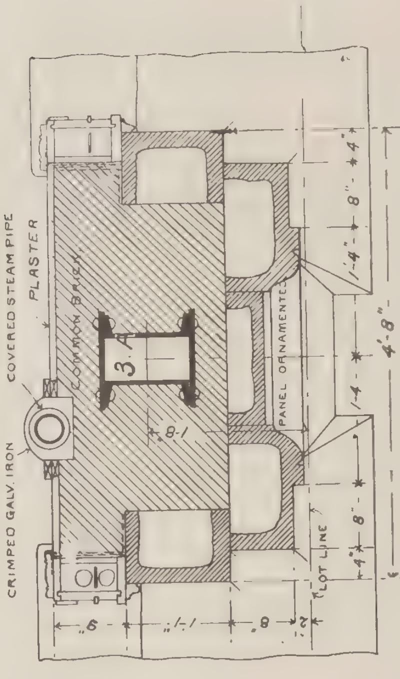
DETAILS OF FIREPROOF CONSTRUCTION.

See page 91.

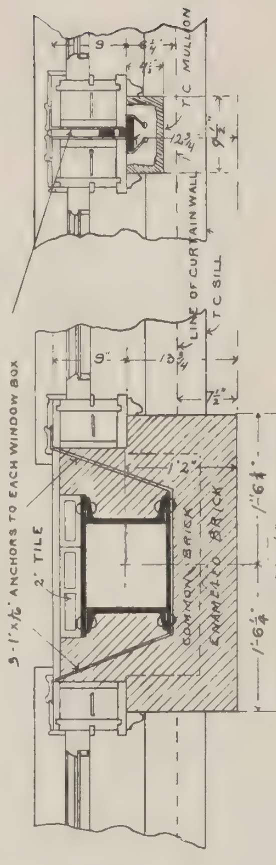
SECTION THROUGH TERRACOTTA FRONTS



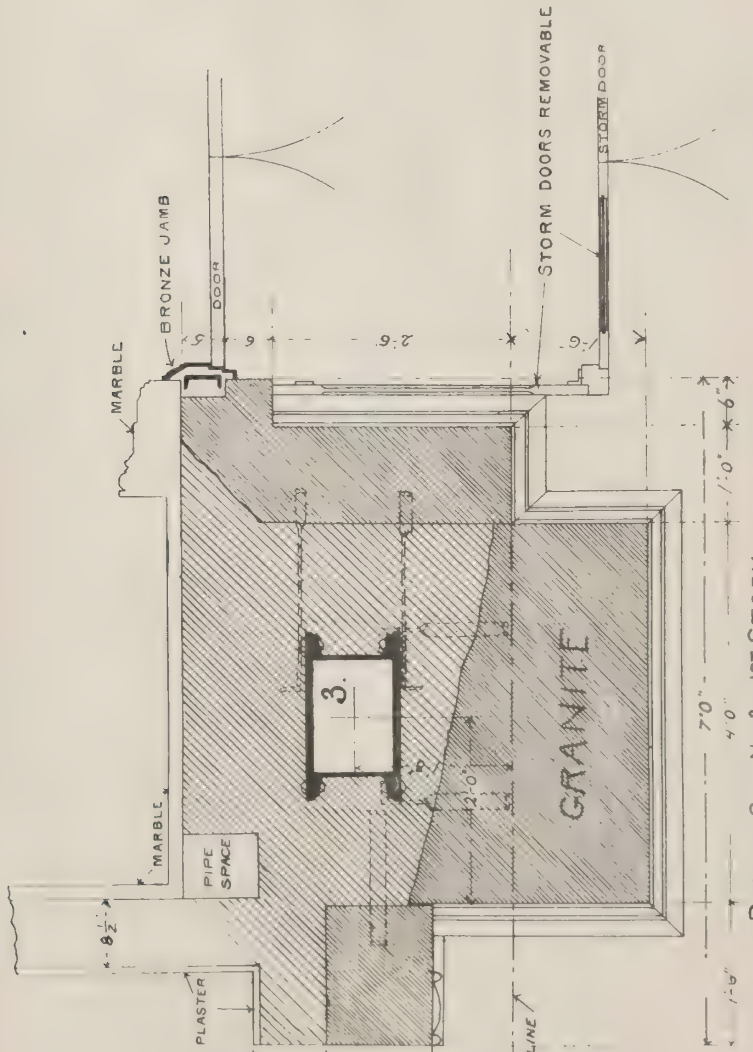
PIER AT COLS. No 7-18-19-37-48 1ST STORY.



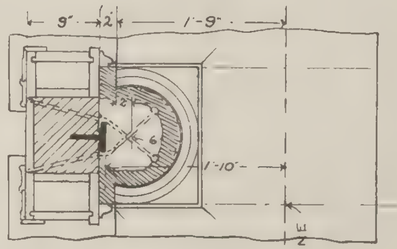
PIER AT COLS. No 3A 4A 18-19-28-29-36-37 12TH STORY.



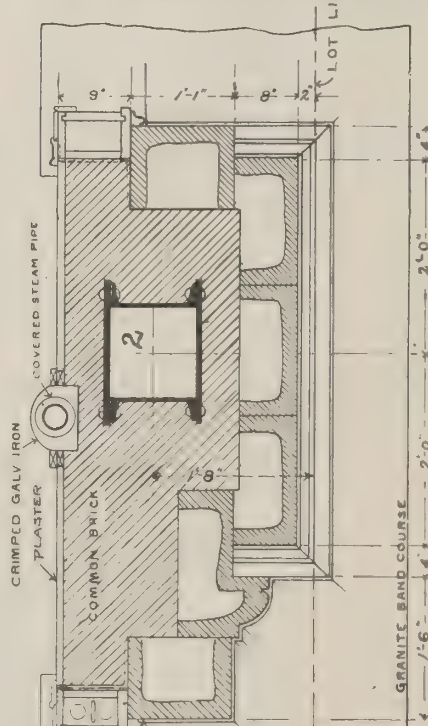
PLAN OF PIERS AND MULLIONS IN ALLEY AND LIGHT COURT



PIER AT COL. No.3 1ST STORY AT MAIN STREET ENTRANCE.



MULLIONS 4TH STORY



PIER AT COLS No 2 AND 7. - 4TH STORY.

DETAILS OF FIREPROOF CONSTRUCTION.

See page 61.

through the interstices of the sheathing to the walls of the trench, where it hardened in flattened ridges; the boards were moulded in these leakages and rotted in place, leaving an imprint whose sharpness demonstrates the energy with which the masonry was rammed.

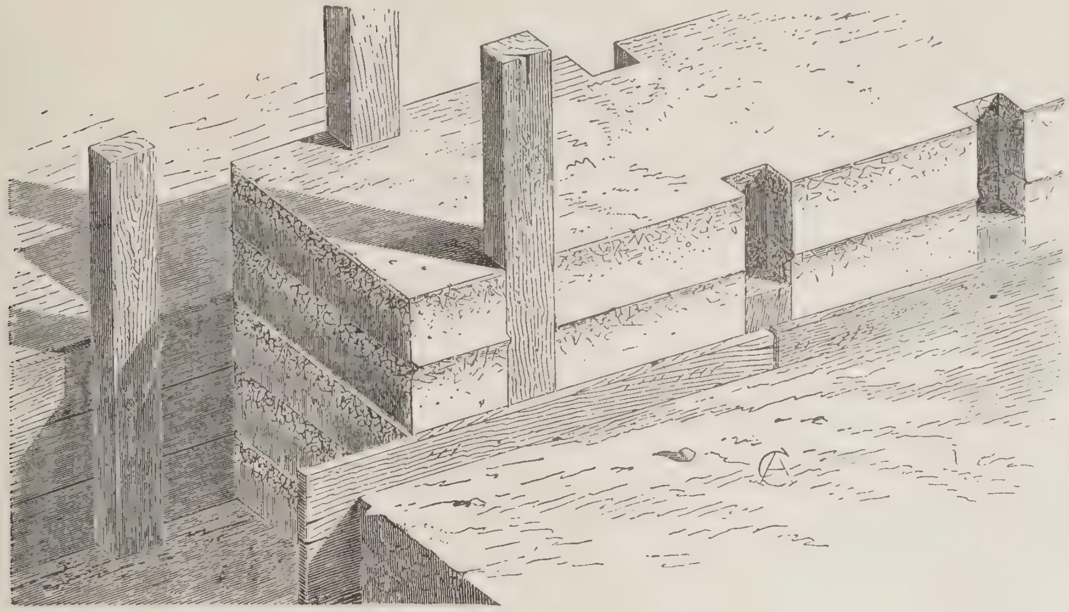


FIG. 2.

As to its composition, the rammed masonry of these foundations is like that which we described in speaking of walls with revetments of stone, except that here layers of dust are entirely absent. But this circumstance is easily explained, for the dust was employed only to utilize the debris made by the cutting of the stone revetments, and its presence between the beds is, so to speak, incidental, and constitutes but a very secondary difference between the two principal uses made by the Romans of rammed masonry.

MASONRY LAID WITHOUT RAMMING.

The rammed masonry we have just examined was laid rapidly and its workmanship was very simple, a double advantage which the Romans appreciated better than any one else. It does not always appear that they were very anxious to make its employment general. They adopted it, as we have said, for walls with revetments of stone, or for subterranean work; but, except for these special cases, rammed masonry was, so to speak, not in use, and it is the second kind of construction still to be described, which must be looked upon as the usual method of ancient Rome.

I do not believe it necessary to explain this new system by a drawing in detail. One can get a clear enough idea of it by turning to the section of a wall pictured in Plate 33. In the first system which we studied, beds of fifteen centimetres of mortar alternated with similar layers of broken stone; in the second, on the contrary, each stone was laid directly on a bed of mortar; in other terms, the new style of masonry was an ordinary rubble, and was not distinguished, by any essential characteristic, from modern rubble. Imagine the beds of mortar a little thinner, and the stones larger, and the kind of work we are studying does not differ from rough rubble such as is made to-day. In rammed masonry, fragments of stone are found in all possible positions, on their natural bed or otherwise indifferently, and the only order existing in the mass resulted from the distribution of stones in large horizontal layers separated from one another by deposits of mortar. The ordinary masonry, on the contrary, shows none of these irregularities; it is a very regular super-position of beds of mortar, at most three or four centimetres thick, alternating with courses of small stones, each piece being laid flat on its natural bed, and, if sometimes broken tiles or the debris of potteries were used in place of splinters of stone, the arrangement of their faces, following the horizontal plane, is always plainly evident.

There is a rather widespread opinion that this ordinary kind of masonry is a sort of beton; that is to say, a mixture of stone and mortar, prepared beforehand and poured on together; but the regular position of the pieces of stone, which are invariably placed with their largest dimensions following a horizontal plane, forbids, I think, this hypothesis. Such an opinion would become even more improbable, if one took into account the size of the stones in the walls. It is not rare to find them from twelve to fifteen centimetres in length by seven centimetres in thickness. I noticed quite a number at the Basilica of Constantine, the Baths of Diocletian and of Caracalla, the Temple of Venus and Rome, etc., which were at least this size. At the Baths of Agrippa I measured some even larger. To spread a mixture of mortar and stones of this size would be, to say the least, a difficult operation.

A last remark will, perhaps, appear even more conclusive. Notwithstanding the care the Romans took, they did not always succeed in filling with mortar the vertical joints between the pieces of stone in the same course. The fragments are but incompletely enveloped by the mortar; in other words, the bed on which they lie and that which covers them did not penetrate far enough into the vertical joints to fill them, and halfway up there remains a gap. Such gaps would never have existed if the materials had been mixed beforehand and poured on together. These spaces are as a rule not easily seen; nevertheless they are not at all singular or exceptional defects, and there are few monuments in Rome, even among those which date from the best epochs, in which they cannot be pointed out.

We have, therefore, sufficient foundation for concluding that beton was not the ordinary masonry of ancient walls. But one must not conclude from this that the Romans were ignorant of its composition and use. Vitruvius speaks of beton in unmistakable terms. He advises its use, for instance, for sub-aqueous works built without coffer-dams. Nothing, however, in the terms which he uses indicates that he means to describe a material in current and general use, and, in fact, the Romans were too wisely economical not to prefer the masonry we have just described to beton, which, without an increase in durability, would have involved a noticeable increase in expense. Their ordinary masonry, as we have said, was enough like beton to be confounded with it, but it must have been much cheaper. The mixture of the stones and mortar requires a certain expenditure of labor, and is a difficult task which the Romans sought to avoid. Hands were not lacking to make the preparation in quantities, but it seemed to them useless, and, instead of making the mixture beforehand, they made it in place. The small stones and the mortar were, perhaps, not so well united, but the regular arrangement made up in part for this defect. All the virtues of their ordinary masonry can be summed up by saying it had all the advantages of beton, and allowed the saving of a great part of the labor which would have been necessary for its preliminary mixture.

On the whole, it may be said that the ordinary masonry of the ancients had for its essential principle the employment of small stones and mortar unmixed; but one can go further and show more in detail the manner of making it.

If, for example, one examines attentively a ruined Roman wall, one can perceive that the beds increase and diminish in thickness, in a slow but regular manner; and this appearance of the beds of mortar is significant, for it shows that the material was spread over large surfaces, which were covered with stones as they were extended, and that the mortar was then thrown on from a shovel, accounting not only for the regular undulations of the beds, but, at the same time, for the presence of the unfilled spaces, or air holes, which were sometimes to be seen about the middle of the vertical joints. Hence, if it is admitted that the mortar was spread in large continuous beds in this manner, the entire procedure at the works is, we may say, explained; one body of workmen with shovels spread the mortar, and another without delay pressed the stones in the bed thus prepared. The work was thus divided into two distinct operations, a division which, at the same time, accelerated its progress and guaranteed its orderly execution. I give this organization of the Roman work only as a conjecture; but the theory has at least the advantage of completely explaining the appearance of the interior parts of the masses of masonry, and, moreover, it accords quite happily with the organizing character which the Romans showed in all the details of the enterprises they directed.

We can now compare the two methods of construction we have illustrated, and seek the motives which, according to circumstances, determined the use of one or the other. As we shall see, they were purely motives of economy, and show how much consideration the Roman architects gave to practical questions.

The Romans sought, first of all, to reduce the time and cost of their work; they feared the least complication or hindrance in the yards, and avoided, through principle, and I might almost say, by system, all work which led only in an indirect way to the end they had in view. Now, rammed masonry can be employed only on the condition of providing temporary moulds; the compression of a mass of the rubble permeated with semi-fluid mortar causes horizontal thrusts in the direction shown by the arrows in Fig. 3; that is, with a tendency to push the reveting walls outward. If, then, the revetment does not in itself have a sufficient stability, it is necessary, in order to apply sufficient ramming, to re-enforce the wall with a supporting scaffolding, with a sort of exterior sheathing or casing. In this there is a complication which the ancients sought to avoid, and with this view they invariably observed the following rule: whenever they could build in a mould of sufficient resistance, they profited by the simplification that rammed masonry afforded; in all other cases they abandoned its use.

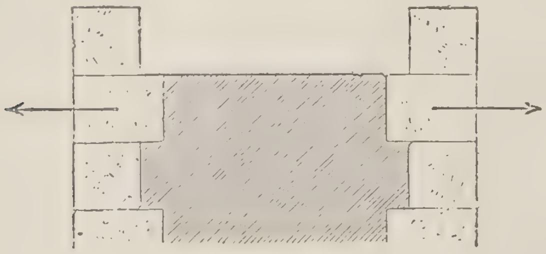


FIG. 3.

This explains, without its being necessary to add to the above simple elucidation of its consequences, the use of rammed masonry for the body of foundations built in trenches, and it also explains its use in walls with heavy cut-stone revetments; while in ordinary walls, the revetting being too thin and weak to afford sufficient resistance to the outward thrust, ramming could not be applied, for it needs only a glance at the revetments of such walls to perceive that it would be impracticable.

The revetment of an ordinary rubble wall was composed of very small cubical stones arranged in such a manner as to make by their joints elegant and varied figures, or more often it was of triangular bricks arranged as shown in Fig. 4. This system gave, with but slight expense, a method of obtaining a very strong bond between the bricks and the core of rubble, but the revetment, far from being able to resist any outward thrust from this core, was only maintained by its adherence to it. It was only an envelope, excellent for protection against the rain, but absolutely incapable of resisting any outward thrust exercised by the filling; and to apply to this filling the methods used in building the tombs of the Appian Way (Fig. 1) was to become involved in the complications which temporary work invariably brings.

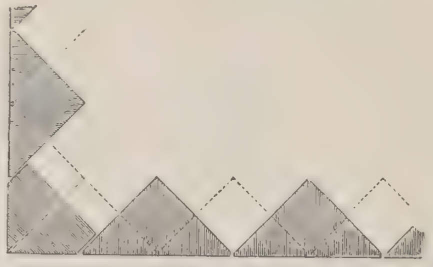


FIG. 4.

The rule agrees, it would seem, with the facts, and it equally agrees with the allusions to the subject found in ancient documents. Vitruvius speaks of the employment of rammed masonry in two cases only; once when he recommended it in the construction of subterranean cisterns, giving the method as follows (Book VIII., last chapter): A trench was cut in the ground with its sides following the faces of the cistern walls, and in it was rammed either beton or rubble, such as we have described; then the core of earth was removed and the bottom laid and rammed down. The second example is in reference to the laying of the rubble filling between two stone facings (Book II., Chap. VIII.), and in each case it is evident that no preliminary casing was necessary. Thus we find in these writings a new verification of a theoretic rule which, however, is sufficiently supported by an examination of the ruins. There is no doubt that the Romans were acquainted with and used coffers in building; among other very clear references, a passage in Varro (de Re. Rust, Lib. I., XIV.) shows that they used them at least for building enclosures of earth unmixed with mortar, such as could only be executed by using some sort of mould. Perhaps they extended this process in certain cases to masonry, properly so-called, but I have nowhere been able to point out with certainty its application, and if masonry involving the use of casing was employed by the Romans, I wish, at least, to show that it never was of sufficient importance to be called a general method.

I know that the exterior aspect of the walls of Roman edifices gives at first glance a certain appearance of truth to the hypothesis which would confound them with masses run into movable moulds. Many holes pierced these walls at different levels, and distinctly recall those which mark the crosspieces of the coffering in our constructions of *pisé*.

The moulds used in this sort of construction usually consist of two panels of planks resting on horizontal crosspieces, and kept at an invariable distance from each other by a simple expedient, of which the sketch (Fig. 5) is a sufficient description. The material of the wall is thrown into this casing, and the crosspieces which support the panels are removed at the completion of the work, leaving holes entirely through the walls, which have quite the appearance of those seen in the Roman masonry.

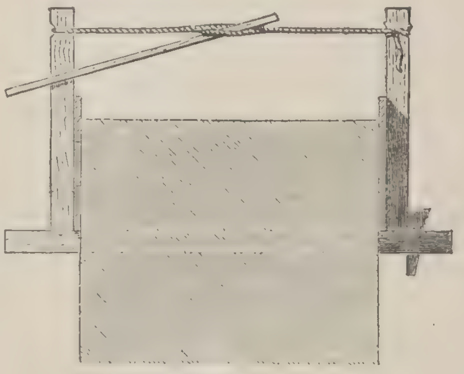


FIG. 5.

An analogy of construction which one might be tempted to draw from this exterior resemblance would be, I think, a very doubtful one. It would be incorrect, in fact, to think that these horizontal holes always completely pierce ancient walls. If the wall is thin, as in Hadrian's Villa, and the radiating walls of the Coliseum near the arena, they go quite through; if the wall is thick, as in the Baths of Caracalla, Basilica of Constantine, the Temple of Venus and Rome, and the Baths of Diocletian, they usually stop at a slight distance from the surface, and nothing authorizes us to conclude that the middle portion was afterwards filled. It seems, then, quite natural to believe that these holes contained, not the crosspieces of a coffering used as a mould for the rubble, but the crossbeams of scaffolding.

They are in fact nothing but the holes, in which the joists which held the footboards were thrust, either completely through the wall or partially so. These holes show the exact print of the joists which formerly filled them. One may see from their crooked imprints how imperfectly squared and dressed was the material of the scaffolding, and the spacing of the holes, so often unequal, shows the rapidity with which the joists were laid, the economy of time and of care with which the entire scaffolding was built. But that which above all is most striking is the irregularity of the imprints of the scaffolding; they are sometimes so strangely twisted that one can safely affirm that the wood was never removed from them, a condition that is very marked in the wall of an ancient edifice, a square tower called the Temple of Janus, which still is to be seen near Autun, of which I give a horizontal section in Fig. 6.

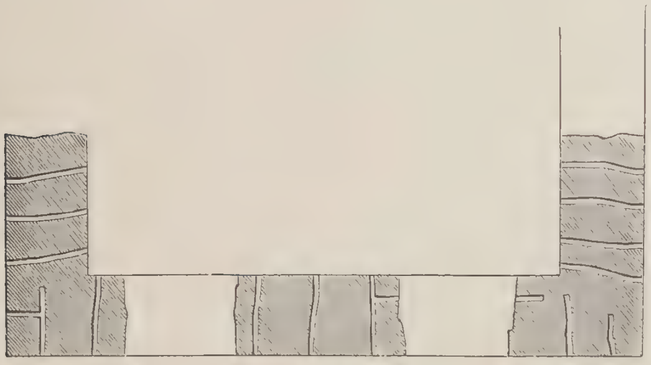


Fig. 6.

More or less marked, according to circumstances, the practice of abandoning the crosspieces of the scaffolding in the rubble seems to have been constant among the Romans. They used pieces of small value to carry the footboards, and, in place of removing them at the completion of the work, they were content with chopping them off or sawing them flush with the faces of the wall, removing only the ends. The parts left thus buried in the masses of masonry rotted in the course of time, and left empty the places they had occupied.

The presence of these empty holes in the mass of the walls seems a detail of little value, and an explanation of them has of itself but a secondary importance; but as several observers have believed that in these cavities lay the indications of a system of construction quite different from that which I have described, it will perhaps be profitable to dwell longer on the origin and the rôle I assign to them. Let us suppose, for the moment, that the wood which had lain in these holes in the ancient walls had been removed; the spaces left by its extraction would have been stopped up by some filling or other of which some indications would still remain, for it would be protected from the rain and would have no tendency to slip out, the sills being horizontal.

Assuredly the filling could be found if it had ever existed; and the only explanation of its absence lies in admitting that the joists of the scaffolding remained in the walls and rotted in place, and this admitted, it becomes easy to imagine the original construction of the Roman walls; and in Fig. 7, a theoretic drawing, it is fully shown. I have endeavored, in drawing the figure, to show plainly the appearance of the built-in joists during different periods and at the completion of the work. It is unnecessary to dwell on their rôle before the work was completed, the figure being quite explicit enough in this respect; the important fact which I wish to point out is their abandonment in the walls. The practice of leaving pieces of scaffolding in the walls may appear strange, not being in accordance with modern construction, but it is assuredly too practical to be regarded as unlikely.

First, in sawing the joists off flush with the walls instead of removing them, all danger of unsettling the masonry which the extraction of them would necessarily have caused was avoided, for it would have been necessary, in order to remove the pieces of wood so often twisted and crooked, to drive them through by blows or to pull them through by main strength, running the risk of weakening the bond of the yet unset mortar; but once the idea of withdrawing them was given up, all chance of this was avoided, and, moreover, the loss of these sticks did not involve, to tell the truth, a great expense, for, as we know, they were of less than mediocre quality.

But the principal merit of burying the beams in the wall was that of tying together the facings, these fragments of wood reaching from facing to facing, recalling, by their position, the long transverse stones which masons place as bondstones in walls of dressed and squared material, and this is not a fanciful comparison; the analogy is exact in every point, and the rôle of the joists extending through these rubble walls is precisely that of the headers in walls of cut stone, the form of the pieces, their position, their tie in both faces of the walls, being similar in the two cases. If, moreover, the testimony of the ancient authors is thought necessary for concluding that similitude of form implies analogy of function, a clear passage in Vitruvius will verify the hypothesis I have enunciated. It has reference to the building of a city: "In the thickness of the rubble," he says, "it is advisable to build in joists of olive wood, slightly charred, traversing the mass from side to side in such a manner as to join together, to tie, as it were, the two faces" (Book I., Chap. V.). And Vitruvius, after having explained his preference for olive wood (which he says dampness rots less than others), adds, "not only fortifications but also foundations and walls of great thickness, tied as just described, will long withstand causes of deterioration."

I have no need to add to such a declaration. Far from weakening our explanation, Vitruvius formulates and completes it; the ancients had so little idea of removing from the walls the timber of the scaffolding incidentally built in them, that they finally adopted the practice of building in, across the masses of masonry, headers of wood, even when there was no need of this, burying the joists in the thickness of the wall in order to carry the scaffold boards.

The headers of wood thus formed a first bond in the rubble, but the Romans used another as much more efficient as it was more costly. It was to build across the wall at different levels isolated courses of extremely large bricks, whose effect was to tie together the two faces; the bricks they employed for this purpose were ordinarily squares of sixty centimetres (about two ancient feet) on the side, and of four to five centimetres in thickness. I have endeavored in Fig. 7 to show the rôle and position of these bricks in the ancient walls. They formed, as it were, levelling beds, which may be compared to horizontal layers of tiling imbedded in the masses. In the greater number of walls these beds were of a single thickness; sometimes two or three layers were directly superimposed, but this was rare; the ancients more often contented themselves with single courses of squares of baked clay traversing the walls horizontally at intervals of between 1.50 metres and 3 metres, the entire wall between two layers of the large bricks consisting of rubble laid without ramming; in other words, the mass of the wall between two successive levelling beds was composed of alternate layers of mortar and of broken stone, enclosed by slight facings of triangular bricks or of small stones.

The remarkable size of the bricks composing these isolated courses, which recur in ancient masonry at regular intervals of about every twenty layers, for example, is sufficiently explained by the bonding qualities which the ancients attributed to the courses themselves. It does not seem as easy to justify the extreme smallness of the stones composing the intermediate courses. It is easily understood that the Romans broke their stone up in very small bits when it

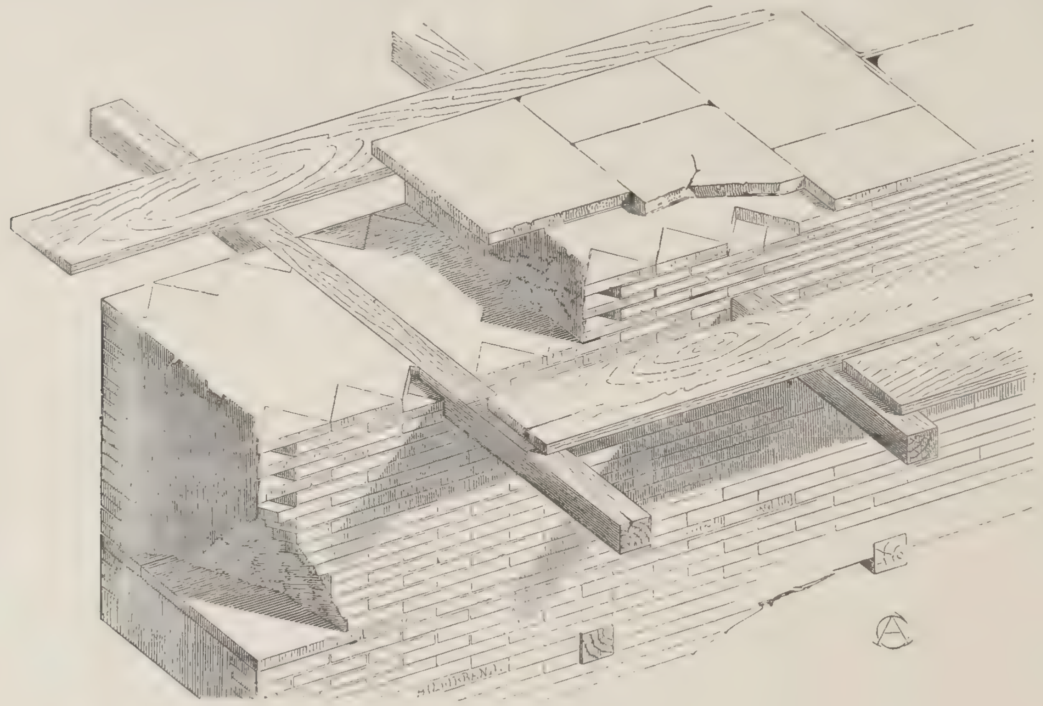


FIG. 7.

was a question of ramming them into the mortar, and it is as easily explained why modern masons break their stone up into small pieces when they wish to mix it with mortar and make beton, the reduction of the materials rendering the mixing, the puddling, easier. But here, was it not sufficient that the blocks could be laid by hand without trouble? It seems strange to see the Romans refraining from the use of any fragment surpassing in dimension a certain average that one can place approximately at ten cubic centimetres at the most. Happily, Vitruvius has taken care to explain it to us. Whatever kind of masonry is employed, he says in his general remarks on construction (Book II., Chap. VII.), one should make the fillings of very small stones, so that the walls, permeated everywhere, and soaked, as it were, by mortar of lime and sand, may last longer. Moreover, Vitruvius returns several times in his treatise to this same precept, to which he seems to attach a capital importance. Thus speaking of the manner of constructing temples (Book IV., Chap. IV.): "If the cella is to be of masonry, let it be composed of as small fragments as possible." This idea was so little peculiar to Vitruvius or to his century that we find it applied to all the monuments of the lowest period of Roman art, and mentioned in the oldest written document which remains to us, on the processes of Roman construction. Almost a hundred years before Vitruvius, a contract for public works, which was preserved by an inscription in the old Latin tongue known as "*Lex puteolana parieti faciundo*," prescribes in most precise terms the limit of size, which must not be exceeded by the materials destined for the restoration of a masonry wall belonging to the temple of Serapis at Pozzuoli, "that the contractor shall not employ in the masonry broken stones which, dry, weigh more than," etc., etc. The date of this regulation is fixed, without possible question, by the names of the Consuls, at 104 B. C. It precedes by a long time all Roman monuments of certain date, in which construction in small materials was used, and the Romans have never, at least in their large buildings, departed from the wise precaution which it lays down.

These different texts show how constant was the employment of this process, and the importance the ancients attached to it, but only the first one gives us the reason. Stones of considerable size in proportion to the mortar laid between them dried the mortar rapidly, and reduced it to a pulverulent condition. They burned it, and it was to avoid this disastrous effect of the rapid drying that the ancients broke their stones up into very small pieces and swathed them in enough mortar to prevent danger of the absorption of the humidity by the pores of the stone.

This precaution was above all useful at Rome, where the ordinary material was of tufa, of volcanic origin, spongy and very absorbent of humidity. One could almost affirm, following the train of ideas indicated by Vitruvius, that the materials were not used until after having been made less absorbent by a preliminary immersion; this would, moreover, accord very well with the terms of the contract of Pozzuoli, which, by designating the weight of the stones "dry," seems to make an allusion to the practice of wetting them before their employment.

Such are, in the aggregate, the processes of building Roman masonry. Variable in their details, following the nature of the materials, these processes are infinitely transformable, and often, between one part of the Empire and another, have no other analogy than evident community of principles.

Hence we must limit ourselves to some general views without binding ourselves to laying down precise rules, the simple enunciation of which would, by its absolute form, give a false idea.

We will place ourselves under a similar restriction during the entire course of this study, and our object in giving pictures of Roman methods will be less to reduce them to formulas than to give a conception of the dominant ideas which governed their application. Thus far we have but filled out the less important part of the programme; we only know the mechanism of ancient construction; we have studied, so to speak, only the trade of a builder: the examination of the application is still entirely to be made. We shall begin it in the following chapter, and the developments into which we shall enter will furnish more than one opportunity of completing by new details this exposition of methods, already long, but nevertheless too summary.

(*To be continued.*)

THE ILLUSTRATIONS.

PLATE 33. ROMAN CONSTRUCTION, illustrating the article on page 83.

PLATE 34. FAIRFAX BLOCK, Geneva, N. Y. *Nolan, Nolan & Stern, Architects, Rochester. Drawn by J. Mills Platt.*

PLATE 35. PERSPECTIVE OF NEW YORK LIFE BUILDING, Chicago. *Jenney & Mundie, Architects, Chicago.*

PLATES 36 and 37. BAXTER BUILDING, Philadelphia. *Yarnall & Goforth, Architects, Philadelphia.* (Plate at three-eighths-inch scale.)

PLATES 38, 39, and 40. Details illustrating article on page 91.

THE BRICKBUILDER.

AN ILLUSTRATED MONTHLY DEVOTED TO THE ADVANCEMENT OF ARCHITECTURE IN MATERIALS OF CLAY.

PUBLISHED BY

The Brickbuilder Publishing Company,

CUSHING BUILDING, 85 WATER STREET, BOSTON.

P. O. BOX, 3282.

Subscription price, mailed flat to subscribers in the United States and Canada . . . . . . $2.50 per year
Single numbers . . . . 25 cents
To countries in the Postal Union . . . . . . $3.00 per year

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Entered at the Boston, Mass., Post Office as Second Class Mail Matter, March 12, 1892.

THE BRICKBUILDER is for sale by all Newsdealers in the United States and Canada. Trade Supplied by the American News Co. and its branches.

PUBLISHERS' STATEMENT.

No person, firm, or corporation, interested directly or indirectly in the production or sale of building materials of any sort, has any connections, editorial or proprietary, with this publication.

THERE is one principle in the designing of brick details that we have persistently repeated in these columns, that special contributors have time after time dwelt upon, and that has been supported by almost every successful design that we have published. Projections must be kept small. We have houses in all our cities and towns where brick has been used to produce ornamental effect, that are made hideous by the extreme projection of the details. Panels are formed by projecting or recessing headers half their length. Surface patterns, in certain lights, throw heavy shadows, which give them prominence out of all reason. The trained men in the architectural profession seldom make these errors, but there are architects, or builders, in all our cities, and particularly in our large ones, who are constantly failing in this direction, as thousands of recent buildings testify. Surface patterns, as a rule, should not be too prominent, and usually, varying the color of the mortar in which they are laid, or sorting the brick into light and dark shades, will be sufficient for any surface decoration. In cornices, where projection is desired, it is almost always safer to adopt some corbelled treatment, building the corbels up by slightly projecting each course. Where dentil courses are used considerable projection is necessary, but this is a special class of detail.

ANOTHER principle fully as important, but which applies in general to all architectural design, is that of the restrained application of detail. Wall surfaces should be kept quiet, treated broadly and simply, the detail applied sparingly, to string courses and cornice, and, perhaps, to openings; but it is often better to treat these plainly, giving attention to their proportions and relation to the wall surface. One of the best examples we know of as illustrating this principle is the Ludlow, in Boston, designed by C. Howard Walker. A photograph of this was published in our April number, last year (page 32). The openings of the first four stories are perfectly plain holes in a perfectly plain wall. The fifth story is treated with arches, in which buff bricks are used with the red, and above this is a very low frieze story, mostly of buff brick with disks of marble to give spots of brighter color. The value of the two upper stories depends very largely upon the simple treatment of the whole building below them. It is so well done that one seldom thinks that this is nothing but an "*ordinary* common brick" building.

CONFLICTING reports as to the condition of the building business come to us from all parts of the country, but recent calls upon the brick and terra-cotta manufacturers, not only in the East, but in the West, found most of them fairly busy, while some had all the business they could carry. That all look for constant improvement is shown by the great increase in our advertising business. We are gratified by this increase, not so much on account of its pecuniary value, as for the fact that it proves that we are satisfactorily filling the special field we have chosen. When a class publication wins the support of level-headed, unsentimental business men, it is pretty good evidence of merit, and it is therefore with no little pride that we point to the advertising pages of this number. With the orders received too late for this issue, we have an almost complete line of advertisements of Eastern brick and terra-cotta manufacturers. Of the latter, only two are conspicuous by their absence, at the time of writing, and we have every confidence that the June number will contain their announcements. It will thus present a complete line of the advertisements of architectural terra-cotta so far as the Eastern field is concerned.

WE desire to call the attention of the practising architects among our readers to the educational value of the reprint of Street's "Brick and Marble," and the translation of Choisy's "L'Art de Bâtir," to the students and draughtsmen in their offices. The former work is, in its way, a classic; the latter, a standard authority. Either of them, if obtainable at all, will cost many times our subscription price. We therefore suggest that for their own benefit the students in your offices have their attention directed to these two features of the current volume, and be informed of our special rates to clubs of five or more, as advertised on page x. Our main object in publishing these two works is to add to the value of THE BRICKBUILDER as a paper for students to read, and we request your co-operation in placing it before them in this light.

IT is comparatively easy to secure for publication good mercantile work in brick, or city residences, schools, and public or semi-public buildings. But it is another matter to locate detached residences of moderate cost which are good examples of the use of brick. There is every reason why such work should be done, and we think it is done, but we know of no way of finding it except by asking all our readers who have done such domestic work in brick, or know of good examples, to send us photographs, sketches, or even blue-print plans, and elevations of their own work, and put us in the way of securing the other work. THE BRICKBUILDER has been sadly lacking in designs of this character, and we make an appeal to our readers to supply the deficiency.

WE also ask the assistance of our readers in another direction. Thus far, in our reprint of Street's "Brick and Marble," the illustrations have been limited to those of the original work. Now that the writer is taking up the cities especially noted for their brickwork, we desire to supplement the original illustrations with sketches and photographs. Verona will be described in the next three issues, and contributions of sketches and photographs will be thankfully received, well cared for, and returned as soon as reproductions can be made. Sketches of detail are particularly desired.

THE following letter we recommend to the careful consideration of all manufacturers desiring to introduce their materials into the buildings of Central Massachusetts: —

SPRINGFIELD BOARD OF TRADE.

SPRINGFIELD, MASS., May 4, 1894.

EDITOR OF THE BRICKBUILDER.

Sir, — We have the pleasure of having THE BRICKBUILDER on our tables, and also of reading the same. I notice that in your March number you refer to "standing exhibits" of building materials as being very much superior to having them scattered among the different architectural offices in any place, and in this connection will say that we have formed in our Board of Trade and Builders' Exchange rooms an exhibit which promises to be very successful. We have divided the same into two parts: one of which, coming under the Board of Trade, will contain an exhibit of all articles manufactured in Springfield; the other, which is held in connection with the Builders' Exchange, is composed of materials which come into the construction and decoration of buildings.

Among the exhibitors in this line are Fiske, Homes & Co. and W. H. Gates of your city, and it occurred to me that an editorial mention in your most excellent publication would be of advantage, not only to us, but to you as showing progression in the lines which you advocate.

We are doing considerable building in Springfield at this time, such as the Young Men's Christian Association building, two new blocks on Main Street, one, a hotel, the other, an office; also a public market is being agitated, and several blocks are contemplated. It might be that you could call attention to this exhibit, which I believe is unique as far as Boards of Trade go, and call the attention of your advertisers and patrons to it. We should be pleased to reciprocate any time when possible. Our Board of Trade is very active, comprising about three hundred members; and the rooms, being open from seven in the morning till nine at night, have a large number of visitors, and are headquarters for meetings of almost every kind.

Trusting I may have the pleasure of hearing from you, I remain,

Yours very truly,
W. A. WEBSTER, *Secretary.*

The above letter is also worth consideration as an index, to some extent, of the way THE BRICKBUILDER is fulfilling its mission. Our monthly correspondence, largely inquiries concerning various clay materials, special forms of construction, particular information as to the planning and design of certain classes of buildings, would fill a number of the paper, and this has by force of circumstances turned our office into a sort of information bureau. There are many instances where the sending of a marked copy of some issue suffices to answer the inquiry; but occasionally, as above, the full letter requires publication.

Manufacturers who are interested in the Springfield Board of Trade's communication should bear in mind the value of this small part of our circulation, *i. e.*, to Boards of Trade, Engineering and Architectural Clubs and Societies, and Builders' Exchanges, where a single copy of the paper finds scores of readers. No manufacturer of clay building materials, of cements and mortar colors, or of the machinery necessary for the production of such materials, can afford to be without liberal representation in our advertising columns, which are as much consulted by our readers as the text pages and plates. To emphasize this, we submit the following letter, the writer of which needs no introduction from us to any reader in the profession or building trades: —

ST. LOUIS, May 14, 1894.

THE BRICKBUILDER, Boston, Mass.

Gentlemen, — I must again compliment you on your illustrated monthly magazine. Your last issue is a pronounced success and speaks volumes in favor of your energy and push.

Mr. George P. Standuhar, architect, of Rock Island, Ill., was in my office a few days ago, and, in referring to your journal, remarked that it was doing the bricklaying and brickmaking interests much good, to which I readily assented.

I am especially pleased with the manner in which you have dressed up my "ad.," and will be glad to have you continue same in its present style until further notice from me.

Yours truly,
ANTHONY ITTNER.

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TERRA-COTTA IN SKELETON CONSTRUCTION.

(*See Plates* 35, 38, 39 *and* 40.)

IT is the intention in this paper to briefly illustrate some of the phases of modern office-building construction. We will consider first the exterior walls — not the foundations, not the interior partitions and columns, not the floor arches (except incidentally), and, except in a general way, not even the steel columns and beams in the exterior walls.

There is much known and much yet to be learned concerning the comparative economy of various kinds of columns under both general and particular conditions, and much yet to be proved concerning the comparative worth of Z bar columns, and plate and channel columns; of the Phenix, Larimer, or Gray columns, etc. Much thought and weighing of considerations is needed in deciding on the kind of columns to be used in each particular building designed. But at this moment we are concerned with the kind of steel construction only as far as it affects or is adapted to its masonry covering. The illustrations will show how brick and terra-cotta form that covering, and how materials other than brick and terra-cotta, such as stone and iron, are used in skeleton construction, either supplementing the former or by contrast showing their inferiority to terra-cotta.

The first structure chosen for illustration is the New York Life Building, corner La Salle and Monroe Streets, Chicago. This is one of the most lately completed of the large office buildings, and is claimed to be an example embodying the most advanced ideas.

A statement of the time occupied in erecting this building is interesting, as it is due largely to the principles of construction. The rapidity of erection has a double interest when the owners of an office-building site calculate the interest on an investment of from $1,000,000 to $3,000,000 while it stands without income-producing power.

The New York Life Building replaced a fireproof building six stories high, which stood alone in that region of the city uninjured through the great fire of 1871. Tenants had moved out and the work

of razing the old building began	May 4, 1893.
Laying out boxes for footings for the new building was not begun till	July 31, "
The first basement column was set	Aug. 17, "
Finished setting fifth floor beams	Sept. 2, "
Began setting tile floor arches	Sept. 5, "
Began setting terra-cotta	Sept. 18, "
Began setting attic floor beams	Sept. 21, "
Began setting window frames in fourth story	Sept. 21, "
Delayed for steel and granite	Sept. 23, "
Began setting enamelled brick, in court	Sept. 27, "
Finished setting roof beams	Sept. 29, "
Finished riveting roof and cornice steel work	Oct. 3, "
Finished laying roof and began plastering	Oct. 9, "
Badly delayed in past ten days for lack of terra-cotta, granite, and enamelled brick.	
Terra-cotta began coming again	Oct. 19, "
Began setting frames for interior tile partitions, third floor	Oct. 23, "
Granite arrived in Chicago	Oct. 24, "
Began setting window sash	Oct. 30, "
Finished setting granite	Nov. 6, 1893.
Finished setting tile floor arches	Nov. 9, "
Finished setting terra-cotta	Nov. 11, "
Began marble work in main entrance	Nov. 28, "
Made fire under boilers	Dec. 1, "
Turned steam on building	Dec. 2, "
Began interior finish	Dec. 6, "
Began running freight elevator	Dec. 11, "
Finished plastering up to eighth story	Dec. 14, "
Plastering complete except patching	Jan. 30, 1894.
First tenant moved in in	March, "
Several tenants moved in about	April 10, "
Only fifteen rooms vacant in entire building	May 10, "

Facility of construction is due to steel work being made at shop ready for erecting, and to the fact that masonry can be building in several stories at once. For example, the terra-cotta exterior walls were begun at the fifth-floor level before any of the granite of first three stories had begun. The drawings published herewith show quite clearly the construction in detail. Only a brief description and some general observations will be attempted here. The building is twelve stories high, beside a basement and a six-foot attic space. The first three stories of the two street fronts are faced with granite. The other stories are entirely terra-cotta. The alley and court side of the building is faced ten feet high with cast iron, and above that, to the top of the building, with American white enamelled brick, the sills, mullions, and lintels being white glazed terra-cotta to match the brick. The fourth side, or end of the building, is a party wall twelve inches thick, built of tile and carried by beams at each floor. The building is 80 feet by 141 feet 5 inches in plan, the main cornice is 150 feet above the sidewalk, and the height of the office stories is 10 feet in the clear.

After the general sketch plans and elevations of an office building are decided upon, a large force of men can start on the working drawings at once. While engineers are making their calculations and framing plans, and designers are working on the elevations, and at the same time making wall sections, others are drawing general plans. After determining generalities in the way of floor and column loads, approximate general sizes of beams, girders, and columns, and method of wind bracing, one of the first necessities is to fix the relation of centres of columns to "building line." The city ordinances fixing minimum thickness of brick, terra-cotta, tile, or stone around a steel column, and the conformation and depth of reveals of curtain and pier walls, all have to be considered; and modifications, both in the steel construction and in the exterior design, have to be made, each in turn due to requirements of the other. If stone is used, greater thickness must be allowed than is needed with terra-cotta or brick.

With all that has been done and said regarding architectural design and decoration on skeleton construction, progress in that respect is sure to continue. But the matter of fire-proofing is still more important, and there is room for much improvement in methods of protecting metal columns and beams. It is coming to be recognized that a double covering is important, so that, if the outer layer becomes loosened by water and fire, a second layer will remain. In view of the poor resistance of stone exposed to fire, it would seem particularly important to protect the steel with fire-clay tile back of the stone;

and how to securely fasten it there is a problem. This will be illustrated further in a later issue of THE BRICKBUILDER. These criticisms do not apply to the building in hand, where, as may be noted on the drawings, there is a considerable thickness of masonry outside of the columns. In some buildings only a thin veneer of stone has been used. But Chicago ordinances now require at least eight inches of terra-cotta or brick outside a column, or six inches of tile, which must be in two thicknesses and have two air spaces, or if stone is used.

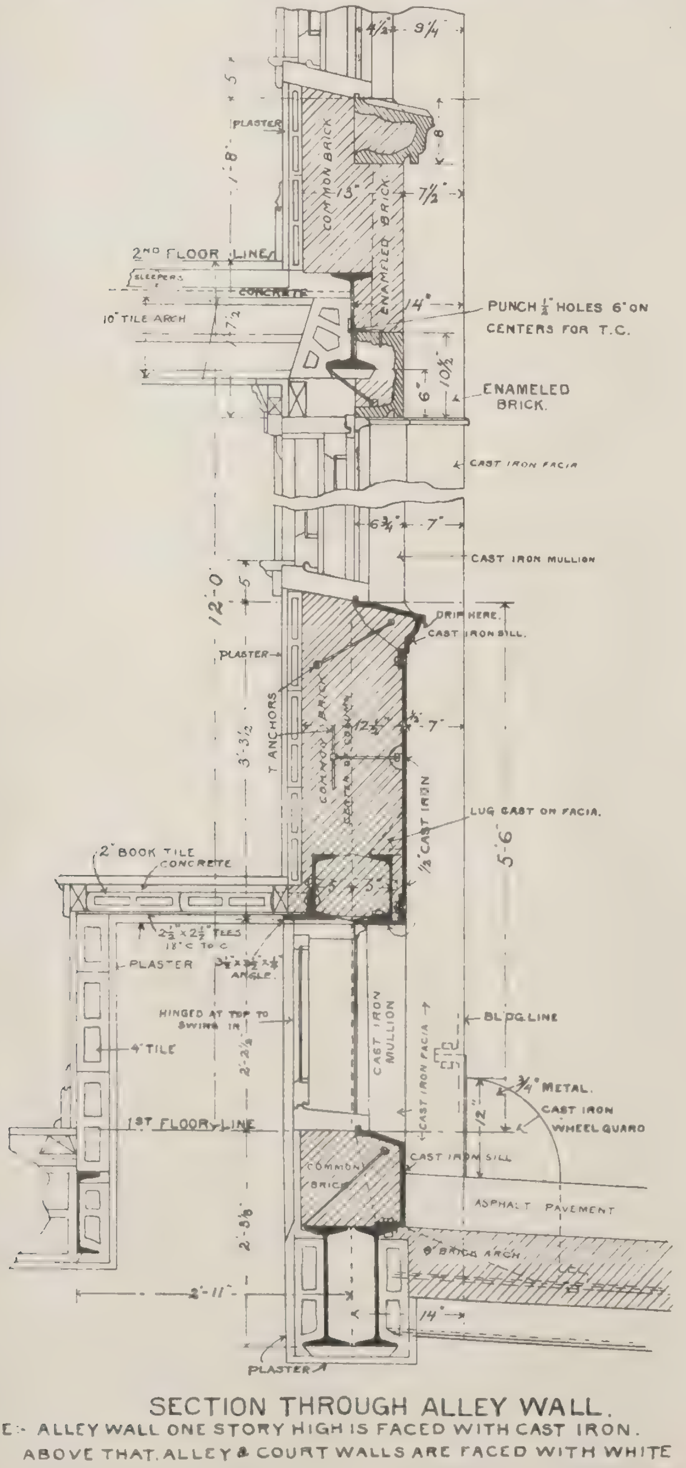
One of the most serious difficulties of wall construction is in connection with lintels. In a conflagration the part of a wall exposed most to the flames is the window head, and it is difficult to fireproof substantially and thoroughly the lintel construction. The illustrations show how simply it was accomplished in the building in question. Ofttimes Z bars and angles, and plates riveted on I beams, are convenient shapes to use, but the tendency is to a waste of steel; plates and Z bars, for example, are not economical as lintel beams.

The projection of the terra-cotta lintel below the beam is better three or four inches rather than less, and the edge of the steel lintel, which cuts into the terra-cotta covering and weakens it, should be three inches away from the face of the terra-cotta. The depth vertically from ceiling line is governed also by the depth of the wood cornice, which contains two pockets for telephone and light wires, extending around all rooms and corridors, and the depth of such cornice is determined by the projection of girders below the ceiling, if any there be. The vertical width of sills and lintels may be varied where either pressed or enamelled brick are used for curtain walls to accommodate the sizes of brick. Roll joints are considered necessary on all projecting courses, if the projection is more than, say four inches. On sills it is much better that these rolls terminate under the wood sills rather than against the edge. Note this on the details.

Cornices are another source of anxiety. The possibility of water and frost working into the terra-cotta joints in after years and making an overhanging cornice dangerous should be carefully considered. Not only should the metal framing of a cornice be amply strong for its load, but each particular piece of terra-cotta ought to be anchored securely to the framing by anchors bent into place while red hot.

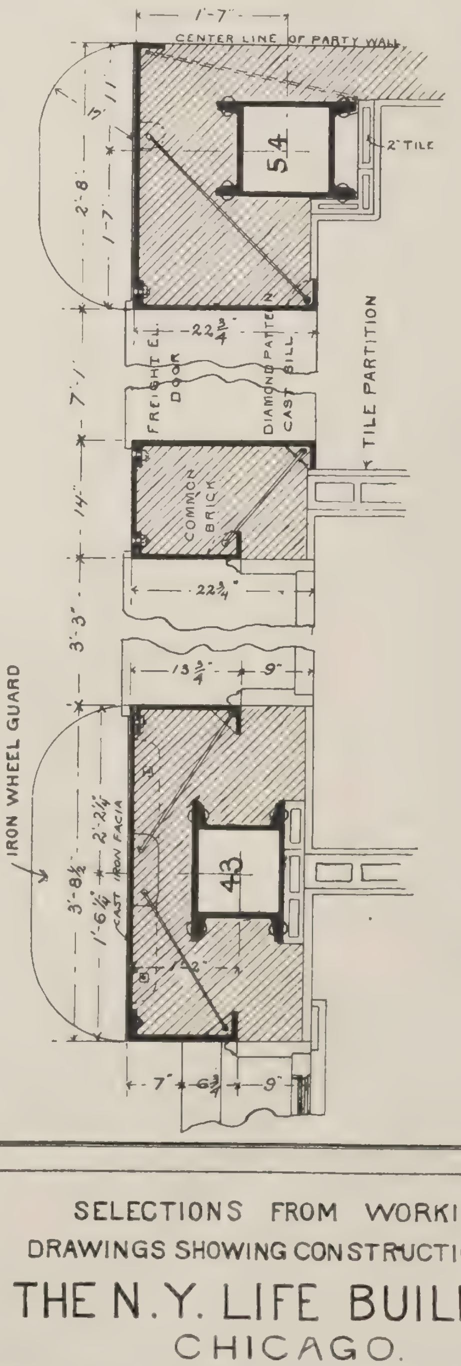
CHICAGO. D. EVERETT WAID.

(*To be continued.*)



SECTION THROUGH ALLEY WALL.

NOTE:- ALLEY WALL ONE STORY HIGH IS FACED WITH CAST IRON. ABOVE THAT, ALLEY & COURT WALLS ARE FACED WITH WHITE ENAMEL BRICK, THE SILLS, LINTELS, AND MULLIONS BEING WHITE GLAZED TERRA COTTA.



PLAN OF PIERS 43 & 54 AND MULLION BETWEEN IN 1ST STORY, ALLEY FRONT.

SELECTIONS FROM WORKING
DRAWINGS SHOWING CONSTRUCTION OF

THE N. Y. LIFE BUILDING.
CHICAGO.

SCALE 0 6 12 INCHES
JANUARY 1894.

JENNEY & MUNDIE.
ARCHITECTS

LIMES AND CEMENTS,

MORTARS AND MORTAR COLORS.

MODERN PLASTERING.

TREATING THE VARIOUS KINDS OF LATH AND PLASTER; THEIR RELATIVE COST AND HOW TO ESTIMATE.

THE question which always arises in the construction of a modern building is, What kind of lath shall we use? or if, indeed, we are to use any. In some of the large cities where every inch of space is desirable in a building, the plastering is applied directly to the bricks, but in such cases the mortar joints should be left very rough to allow the plaster to adhere more fully; the walls should be washed free from dust, and if the bricks are very dry they should be dampened as the plaster is applied. There are, however, several objections to this style of plastering, although the cost is considerably less, the most prominent being its liability to gather dampness.

Wooden lath will cost us less than metal and in ordinary cases are perfectly satisfactory. Fourteen bunches of lath and five pounds of nails will be required to every one hundred yards of plastering, and a good lather will put on from fifteen to twenty bunches per day.

But if our building is to be perfectly fireproof, we must use metal lath, of which there are several distinct patterns, the two principal ones being the expanded metal, and wire-cloth lath. As compared with wooden lath, the advantages of expanded metal lath are that it affords a better key for the plaster, is absolutely fireproof, and the ceilings and walls will never crack. The price of this lath is twenty cents per square yard, and it will cost five cents per yard to apply it to the work; about the same amount of plaster will be required as on the wooden lath.

The Kelly corrugated wire lathing consists of flat sheets of wire cloth with ribs or corrugations running lengthwise at intervals of six inches; the depth of the corrugations three eighths of an inch. These sheets are applied directly to the under side of the floor timbers for the ceiling and to the partitions for the side walls and secured with wire staples, thus avoiding the use of furring.

Another style is the stiffened wire lathing, this being a wire cloth, into which, at intervals of seven and one half inches, V-shaped strips of No. 24 sheet iron are woven. This gives a smooth, firm surface for plastering upon, and is secured by driving a nail through the bottom of the V, and is applied directly to the timbers with a stretcher. This lath will cost us a trifle more than the expanded metal lath, but it is the verdict of some of the leading architects that this is the best fireproof lathing in existence.

And now, having examined the various kinds of lath, let us proceed with the plastering.

The plastering of the inside of buildings, whether done on wooden or metal lath, brick or stone, usually consists of three separate coats of mortar. The first, or scratch coat, is put on roughly, and if common mortar is used should be pressed on with the trowel with sufficient force to enter between the lath and form a clinch. If adamant or other patent plaster is used, the first coat will not require to be forced through as much. The second coat, or browning, is put on about three eighths of an inch thick, and, should the scratch coat have become too dry, it may be dampened slightly. This coat should be well screeded, as all walls are generally warped or out of line, and to remedy this screeding is resorted to.

The third coat, or hard finish, consists of one part plaster-of-Paris to two parts lime putty without sand; for sand finish add white sea sand. Hard finish works easily, but is not as good as a stucco finish for walls intended to be painted in oils. Stucco finish is made of one part of lime to two parts of sea sand and marble dust, and should be worked with a float in a circular direction, then polished with trowel and brush. Any one of these third coats may be polished more or less, according as it is to show or be painted or papered.

Another and cheaper mode of plastering is to put on but one coat of brown mortar, and finished with a coat consisting of six parts of putty to one of sea sand, and should be skimmed on very thin, while the first coat is yet green, therefore its name, green-skim finish.

There has lately been introduced an entirely new method of wall and ceiling plastering, which claims some advantages over the old method, namely, ease and speed in covering, and in securing the plaster against falling and fire. Instead of spreading the plaster on laths, it is prepared in solid slabs or blocks, and then nailed to the joists and studs. These slabs may be made of any convenient size or shape, and may be prepared by a skilful workman in the following manner: Select some smooth, hard surface, and set up sloping sides to give the slabs a bevelled edge. Now pour in a thin layer of plaster-of-Paris of such consistency that it will run readily to the mould; upon this, and securely bedded into it, spread a piece of canvas or burlap. Laths are then laid along two opposite sides of the slabs, and over all is spread a thick layer of common plastering mortar, with a little plaster-of-Paris added to increase its setting qualities. However, before it sets it should be brushed over with a coarse broom to produce a rough surface, which forms a key for the finishing coat of mortar. When the mortar has set, and the slab is dry and hard, it is ready to raise to its place and fasten by nails driven through the laths. The finishing coat may now be applied in the usual manner, filling up the cracks between the slabs, so that it presents when finished a hard, uniform surface.

Having now examined the different systems of plain plastering, let us look into the ornamental decoration, such as cornices, mouldings, arches, centrepieces, etc.

In order to execute a cornice of a given pattern it is first necessary to prepare a mould of the several members, which is generally made of metal indented so as to represent exactly the various forms and projections of the respective members, and fastened into a wooden frame with a handle. Two workmen are necessary to run cornice properly. Should the cornice be of unusual size, such as are sometimes seen in halls and large dining-rooms, it is necessary to frame them by nailing brackets to the wall, about sixteen feet apart, to which laths are nailed. Then cover the whole with brown mortar, allowing one inch for the putty which forms the cornice.

Before using the mould, a screed should be fastened on the wall and ceiling of putty and plaster wide enough to admit the top and bottom of the cornice to be formed. Fit the cornice mould squarely into the angle at one corner of the room, and mark the outer edge of the cornice on the ceiling screed; also make a mark at the opposite angle, and from the two marks obtained strike a dark chalk line. Now nail a pine straight-edge, one half inch by three inches, on the wall screed, have the under side of the mould set squarely upon this, and have the upper outside edge of the mould in line with the chalk-line on the ceiling. This forms a guide to run the cornice.

All now being ready, mix lime putty with about one third plaster-of-Paris and of a semi-fluid consistence by the addition of clean water. One of the workmen then spreads the prepared putty on the surface where the cornice is to be, while his companion applies the mould from time to time to determine where more or less of the material is required. When all parts of the mould are apparently filled, the mould is worked backwards and forwards, at the same time held closely to the wall and ceiling, and by this means the superfluous material is forced out, and the outline of the cornice completed to the required form.

Sometimes it is necessary to repeat this operation when the filling is deficient in the former application. If the cornice is large, it is necessary to use three or four moulds in succession. Great care should be exercised in finishing the mitres at the angles, and it requires skill and good taste.

Additional ornaments may be made for enriching the walls by making a model from clay or other tractable material from designs made for the purpose. Skill, taste, and a large amount of perseverance are necessary to insure success. Having finished the model, it should be left until it hardens, then oiled thoroughly all over with sweet oil, and placed in a wooden box. The next operation is to pour melted wax and rosin into the box until the model is covered, then leave it until it is thoroughly cold and hard; turn upside down and the wax will readily slip from the clay mould and becomes a mould for future castings. The casts should be made of the purest and finest plaster-of-Paris well saturated with water, and the mould must be well oiled or the casts will stick and be liable to break in removing.

Gelatine is widely used to make the above ornamental casts. Take good glue, well soaked and swelled, and pour off the excess of water, and add glycerine six times the weight of the dry glue used. Heat and evaporate water sufficient to make the substance the proper consistency for use. Modelling clay is made by kneading dry clay with glycerine instead of water.

We have now considered the most common modes of plaster ornamentation, although there is practically no limit to the decorations which a skilful and ingenious workman may produce.

Not the easiest task in connection with this work is the estimation of the cost. At the present rate of wages, mason at $3.75 per day, and laborer at $2, and the current rate for material, plastering is taken for from thirty cents to forty-five cents per square yard, according to the lath, finish, etc. Soffits, friezes, etc., are taken by the foot, according to description. Measure raised panels extra by the superficial foot. Take the mouldings or the panel by the running foot.

Cornices are generally taken by the foot. If the girth of the mouldings from the ceiling to the wall line is under six inches, take it by the running foot; if over six inches, by the superficial foot. The cost of cornices and mouldings varies according to the size of the moulds, and are taken for from twenty-five to fifty cents per foot.

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Plaster arches are taken by the piece, and the contractor must place a price upon them from former experience, but in ordinary cases they run from three dollars to twenty dollars, and even more for very stylish or ornamental patterns.

Trusses, centrepieces, etc., are bought by the piece, and at the present time from one dollar to fifteen dollars.

Having thus briefly followed and explained the different stages of the plasterer's art, we trust the reader, whether master or apprentice, will have received some profit thereby, and have gained a better insight into the methods of modern plastering.

New Britain, Conn. R. N. BUELL.

PRACTICAL OBSERVATIONS UPON PORTLAND CEMENT.

(FROM A PAMPHLET ISSUED BY THE LAWRENCE CEMENT COMPANY.)

TRUE Portland cement requires but little water to make a good mortar.

During the mixing with water, Portland cement undergoes a diminution in volume of $\frac{3}{10}$.

Portland cement contains after consolidation about ten per cent of water chemically combined, and has a specific gravity of $2\frac{6}{10}$.

One volume of Portland cement will take $\frac{35}{100}$ to $\frac{44}{100}$ volumes of water.

If a greater quantity of water is necessary to make a proper mixture, considerable heat is developed, indicating the presence of an excess of free lime.

If a smaller quantity of water is required, it is evident the cement was over-burnt, or too old, or already surcharged with water or carbonic acid.

Cement can be spoiled by a deficiency of water as easily as by an excess.

One cement may give the highest results with eighteen per cent (by weight) of water, but be totally destroyed by adding only sixteen per cent of water.

The greater the increase per cent between the seven day and thirty-day tests, the stronger and harder is the cement likely to become. This increase should be at least twenty-five per cent.

The fineness of Portland cement when ready for market should be such that not less than ninety per cent of it will pass through a wire sieve of twenty-five hundred meshes to the square inch.

The finer a cement is ground the more bulky it becomes, and the less it weighs by measure.

It is only when mixed with sand that the most important cementing properties of Portland cement can be appreciated. This power of *uniting* other substances is totally distinct from the ultimate strength the cement attains.

Two per cent additional water to a cubic yard of moist sand will decrease its weight eighteen per cent.

The simplest way to ascertain the measurement of the interstices in loose building sand is to fill, with dry sand well shaken down, a vessel of the same capacity as a cement barrel, and then pour in such a quantity of water as will fill all the spaces between the particles of sand.

The proportion of water used for this to the quantity of sand gives the measure of the voids in the sand.

From various experiments in this direction, it is definitely determined that the void spaces in medium coarse building sand amount to two fifths of the volume; so that two barrels of Portland cement may be judiciously mixed with five barrels of dry sand. If the sand used is damp, it will not be wise to use more than three barrels of such moist sand to two barrels of cement.

Cement mortar is said to have *set* when it has lost its plasticity and becomes so hard that its form cannot be changed without breaking.

A true Portland cement is classed as *slow* setting when it takes over a half-hour to harden.

The hardening process, which takes place when cement is mixed with water, has been explained in several ways. Most authorities ascribe the solidification to the formation of calcium silicates and aluminates, or else a bibasic compound is formed of double silicates of calcium and aluminum, which contain water of crystallization.

As to the manner in which these substances are formed, some hold that it is in the process of burning the raw material, and exists in the anhydrous condition of the dry powdered cement, immediately crystallizing on the application of water.

The Alpha Portland Cement.

Its superiority is fully established; for fineness, uniformity of color, and great tensile strength it is unexcelled. Every barrel of "**ALPHA PORTLAND CEMENT**" guaranteed equal to the very best brands of "German Portland Cements," and its minimum tensile strength guaranteed as follows:

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WM. J. DONALDSON & CO.,
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GUARANTEE.

1 day in air, 6 days in water,	400 lbs.	Neat test Per square inch.
1 " " " 27 " " "	500 "	
1 " " " 3 months in water	600 "	
3 parts of sand to 1 of cement.— Adhesive test.		
1 day in air, 6 days in water,	125 lbs.	Per square inch.
1 " " " 27 " " "	175 "	

FINENESS.

Residue on sieve No. 50,	None.
" " " " 100,	10 per cent.
Passing through sieve No. 200,	65 "

Every barrel guaranteed to stand the boiling test, the test for safety.

DYCKERHOFF PORTLAND CEMENT

Is superior to any other Portland Cement made. It is very finely ground, always uniform and reliable, and of such extraordinary strength, that it will permit the addition of 25 per cent more sand, etc., than other well-known Portland Cements, and produce the most durable work. It is unalterable in volume and not liable to crack.

8,000 barrels have been used in the foundations of the Bartholdi Statue of Liberty, and it has also been used in the construction of the Washington Monument at Washington.

Pamphlet with directions for its employment, testimonials and tests, sent on application.

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Elastic Oil Cement. This is made expressly for laying or embedding Slate and Tile Roofs, repairing leaks around Chimneys, Dormer Windows, Skylights, Scuttles and Fire Walls; it is waterproof and will not crack. Made in three colors, Red, Brown and Black.

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◆◆

Messrs. Hewitt & Bro., Architects,
PHILADELPHIA.

◆◆

Messrs. Dorsey & Smith, Builders,
PHILADELPHIA.

◆◆

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BRICK, AND THE COMING MODEL CITY, SERIATELY TREATED AND CONSIDERED.

By J. W. Crary, Sr.

THE cause and power of progress to greatness of a country lies in its inventive genius, skill, and energy. Egypt, Greece, and Rome were examples of this fact in ancient times. France, Germany, Great Britain, and the United States are the prominent evidences o this truism in modern times. When I say inventive genius, I do not use the term to imply only the invention of things in mechanics and physics, but as well in metaphysics.

THE GOVERNMENT OF THE UNITED STATES IS AN INVENTION.

True, it is the joint work of many great minds, and so is the invention of every great improvement of modern times, in mechanics and the sciences. It is a fact that not one single great invention known in our patent office is the product of one mind, independent of all others. The United States surpasses all other countries in inventive genius, but the field of invention is only fairly opened, and some parts of it have never been cultivated.

THE LAYING OUT AND BUILDING OF OUR CITIES YET ANCIENT IN STYLE.

The renaissance of the Greek, Roman, and Gothic styles of building mixed with modern genius has given architecture an endless variety, a versatile taste, and, in some instances, a grotesque appearance. The Italian Renaissance is thought to be the most reasonable and tasteful, and that is divided into three distinct styles; viz., *Florentine*, *Roman*, and *Venetian*. Each of these styles has a peculiar excellence, and the architects of all other countries seem to have derived their chief inspiration from these Italian schools.

PROGRESS IN THE STYLES OF ARCHITECTURE HAS KEPT PACE WITH MOST OF OUR MODERN IMPROVEMENTS, BUT THE PLANNING OF OUR CITIES IS FAR BEHIND THE AGE.

The cities of the world are planned and built up to suit ancient institutions, ways, and means of life and business. Our cities are built to suit a niggardly economy in land, and room for proper business and living. Most all the true laws of health and the best social life are ignored or violated. Streets are narrow and buildings are high. Sunshine and pure air are practically excluded. Families are grouped together in "tenement houses," and the poor classes live like animals in a menagerie. In such a place the growing of health, moral character, and honesty, or self-respect and good intelligence, is impossible. These pest-houses of human degradation are shamefully tolerated in all of our large cities, the biggest cities having the greatest number and the worst style of houses. The houses called "stylish (or modern) flats" are alike detrimental to health or moral and social progress.

COMMONALTY IN FAMILIES AND INDIVIDUAL SELF-RESPECT ARE INCOMPATIBLE THINGS.

It is the distinct, isolated individuality of family life that produces our great men and women. Heterogeneousness in the social contact of families is the inoculation of moral poison. The well-regulated, intelligent, separate, and distinct family is of itself a miniature nation. It represents a *minimum* of the *maximum* of the body politic. The increase of respectable families implies and assures the healthy growth and power of the general government. If it were not for the conservative power of our rural population, the moral equilibrium of the body politic would be destroyed, and the great cities, with their present plans for streets, buildings, and mode of living, left to themselves, would soon fall into despotism under the wealthy privileged classes.

WE WANT OUR CITIES BUILT SO AS TO ISOLATE AND INDIVIDUALIZE THE FAMILY. HERE IS A NEW FIELD FOR INVENTIVE GENIUS AND ENTERPRISE.

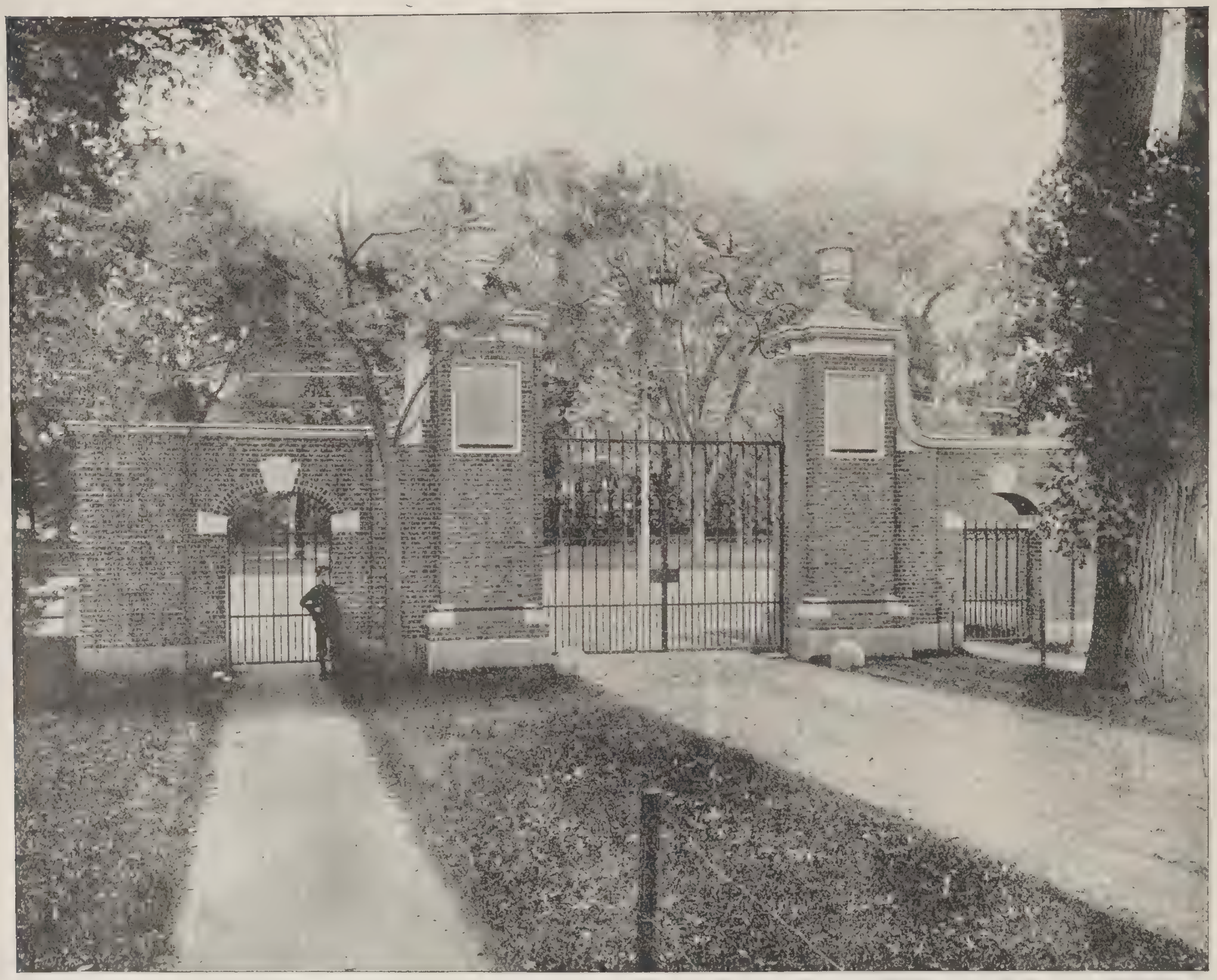
We want wide streets and detached, separate dwellings, not over four stories high. We want narrow parks in the centre of the streets. We want a perfect system of sewerage. We want a healthy and abundant supply of water. We want a sure and efficient plan for preserving cleanliness in all public and private places. However inquisitorial it may seem to be, every back yard, every water-closet, sewer, and privy of every house should be open to the inspection of proper and trustworthy officers. Streets should be paved with brick, made of suitable clay, and perfectly burned; and it is needless to say that all streets and private or public houses should be kept clean, with scrupulous, searching care.

ALL HOUSES SHOULD BE BUILT OF MATERIAL THAT WILL NOT RUST OR DECAY.

Brick and terra-cotta (which are really the same in substance) should be used exclusively for building houses in a city. If these materials are used as they should be, and can be used, a building would be like a piece of good stone or earthenware. The walls, floors, ceiling, and roof could be cleaned and washed the same as an earthen plate or pitcher. Brick and terra-cotta can be made cheap, to suit every part and place in a house where wood or metal is now used, and it is only for the architect to study and plan his work to suit the adaptability of brick and terra-cotta to it in most all of its details. I will hereafter make suggestions in this line of thought.

WE WANT INVENTORS TO IMPROVE THE BUILDING OF CITIES.

Putting the sanitary question between open, airy-built cities and compactly built cities out of the way, and claiming that an openly built city would take up too much ground, and increase the distance and expense of travel, it is obvious and plain that cheap rapid transit, as we now have it, and still better, as we will have it, would much more



EXAMPLE OF COMMON HARD BRICK FOR ENTRANCE GATES.
SIDE GATES AT HARVARD UNIVERSITY, CAMBRIDGE, MASS.
McKim, Mead & White, Architects, New York.

than compensate for all the saving of distance in travel in a compactly built city. We can travel five times faster now in a city than we could fifty years ago, and it is reasonable to say that improvement in city travel will always be equal to the expansion and growth of the city, and the short and the long travel will always be the same in cost, without any serious or appreciable difference in time.

THERE IS A GREAT FIELD OPEN FOR CAPITALISTS AND INVENTIVE ARCHITECTS.

The planning and building of new cities, and extending old ones; the idea of saving ground or economizing space (and spoiling a city), in a vast country like ours, is so absurd and foolish that a sensible man or thinker would feel contempt rather than admiration to see little three or four acre patches of land (surrounded by narrow streets) all piled up with buildings from one to two hundred feet high, full of people, and mouldering goods, and all other things that befoul the air and breed disease, as well as to contaminate virtue and good morals.

Let our city builders resolve that we will modernize and Americanize our cities, go out into the suburbs, lay off the land so it will be about half streets and half building lots. Then absolutely forbid the use of anything for walls excepting brick and terra-cotta, and also that no "tenement houses," or "stylish flats," or excessively high houses shall be built.

BRICK AND TERRA-COTTA CHEAPEST FOR BUILDING HOUSES.

I have said that all other materials for building houses in a city than brick and terra-cotta should be excluded. I know that even fairly good lawyers would say that no law could be enforced that would give a monopoly to any one kind of building material, and that any fireproof material for building houses could be used, notwithstanding a law passed by a legislative body to the contrary. The common law says, "the law forms things for the good of the Commonwealth"; "private good yields to public"; "private loss is overbalanced by public good." Will any respectable lawyer dispute these quoted maxims? If brick and terra-cotta are really the best fireproof building materials, have not the inhabitants of a city the right to the best protection against fire? Is it not competent for the law-making power of the city to say that its citizens shall be entitled to use the best means for protection against fire? Not only the question of security from loss by fire is involved in building a city, but also the question of both private and public economy. I will here refer to one single item; viz., —

THE ITEM OF INSURANCE.

Although the general public do not study or concern themselves about insurance, it is a fact that the insurance policy is a species of gambling, in which the whole community plays a part. Every person who rents a house, or eats, drinks, or wears, and, I may say, many that

THE BRICKBUILDER.

VOL. III. BOSTON, JUNE, 1894. No. 6.

A SKETCH OF THE LITERATURE OF CLAYS.

(Continued from May number.)

GEOLOGICAL AND TECHNICAL DISCUSSIONS OF CLAYS IN VARIOUS STATES.*

ALABAMA.

"The Clays of Alabama" is the title of an article by Eugene A. Smith, State geologist. It is published in the proceedings of the Alabama Industrial and Scientific Society, Vol. II., 1892.

CALIFORNIA.

In the Eleventh Annual Report of the California State Mining Bureau, published in 1892, there are articles on the most famous of the Pacific Coast clays, which include those in Amador, Marin, Placer, and Sutter Counties.

NEW JERSEY.

In Vol. VI., Transactions of the same Institute, Prof. J. C. Smock published a valuable discussion of the clays of New Jersey, the material of which, however, has been more fully treated of in the clay reports of the Geological Survey of that State, mentioned above. This paper, which was read before the Institute, was followed by a discussion by different members, bearing on the origin of the clays, and especially on the presence in them of titanium.

NEW YORK.

Concerning the clays of New York State, several papers have been published by Heinrich Ries. Among these is one which has the following table of contents, that best shows the nature of the paper: "CONTENTS.— General Remarks on the Clays; Clay Deposits of the Erie, Ontario, St. Lawrence and Champlain Watershed; Clays of the Mohawk and Hudson River Watershed; Clays of the Delaware and Susquehanna Watershed; Staten Island Clays; Long Island Clays." It is a concisely written paper and full of information.

Another paper by the same author may be found in the Tenth Annual Report of the State geologist of New York for 1890. It is a valuable article describing the Hudson River clay banks and clay works.

PENNSYLVANIA.

The State of Pennsylvania has numerous accounts of its valuable clay and kaolin deposits distributed through a number of volumes, and any one seeking information concerning the clays of any part of Pennsylvania should look in the State Geologist's Report for the county in which they occur.

WISCONSIN.

In a paper entitled "Mineral Resources of Wisconsin," by Dr. R. D. Irving, late Professor of Geology in the State University of Wisconsin, published in Transactions of American Institute Mining Engineers, Vol. VIII., the author briefly discusses the brick clays of the State, which he says have practically all been deposited by a former extension of the lakes beyond their present size. They are all "characterized by the presence of a large amount of carbonate of lime." The clays bordering Lake Michigan are extensively worked, those on Lake Superior are not yet used; the white or cream-colored bricks, known as Milwaukee bricks, are made from this formation. Attention is called to the fact that cream-colored bricks are made of a clay which often contains more iron than that from which the red-burned bricks are made. "The white bricks are burned at a very high temperature and lose their color only at incipient vitrification." The brick burns cream color owing to the presence of a large amount of carbonate of lime. Ordinary clay burned with oyster shells will give the same result.

In the interior of the State at various places red bricks are made from residuary clays.

The author next discusses at greater length the existence of kaolin in Wisconsin. The localities are confined to a belt of country about fifty miles in latitude, stretching east from Black River in Jackson County to the vicinity of Grand Rapids.

The nature of the kaolin occurrence and its geological origin is discussed, and its probable continuous existence in narrow bands crossing the country in straight lines parallel to the general strike of the rocks. It is essentially a decomposition produced from beds interstratified with the Laurentian rocks. The kaolin is confined almost entirely to the "driftless" area, or that region which was not covered by the ice in the last great glacial period, the absence of the kaolin in other parts of the State being attributed to its removal by the ice sheet.

A table of twenty-five more or less complete analyses of these kaolins is given.

GEOLOGICAL DISCUSSIONS NOT INCLUDED IN THE ABOVE.

Among a large number of publications on various clays considered essentially as geological formations, there are a few so important to the student of clays in general that they well deserve mention here. One of these is Bulletin No. 52 of the United States Geological Survey, by I. C. Russell. It is entitled "Subaërial Decay of Rocks, and Origin of the Red Color of Certain Formations." It is a thoroughly scientific and comprehensive treatment of the subjects discussed, and contains at the end a long list of papers relating to the same problems.

Prof. W. O. Crosby, of the Massachusetts Institute of Technology, has published a valuable contribution under the following title: "On the Contrast in Color of the Soils of the High and Low

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*Other references to the literature of clays in certain States were given in the preceding number, under the heading, "Industrial Publications."

Latitudes," much of the subject matter of which belongs to clays. It is in the nature of a reply to some of the conclusions drawn by I. C. Russell, whose paper is mentioned above.

Prof. Crosby is also author of a paper "On the Composition of Till or Boulder Clay," each of these papers being published in the proceedings of the Boston Society of Natural History; the former in Vol. XXIII., the latter in Vol. XXV.

The *Canadian Naturalist*, new series, Vol. VI., has a paper by Sir J. W. Dawson, on the "Post-pliocene Geology of Canada," in which may be found an account of the so-called Leda clays and of the till and boulder clays of that country.

In a work entitled "The Geology of England and Wales," by H. B. Woodward, the different clay formations are treated of, geologically, and following the description of each geological formation, in special parts entitled "Economic Products," the clays of the various formations are considered from that standpoint.

W. J. Henwood, in his work on the "Metalliferous Deposits of Cornwall," in describing the St. Agnes and Perram-Zabuloe districts, describes the china clay deposits of that vicinity and gives theories of their origin.

Among the reports on the scientific results of the voyage of H. M. S. "Challenger" is that on "Deep Sea Deposits," by John Murray and A. F. Raynard, which contains elaborate treatises on the clays and clay formations of the deep seas and the marginal regions of the ocean shores. These are not only extremely valuable and interesting in themselves, but are further useful in enabling us to get a better idea of the origin of the clay beds which we find at present on our continents.

In the August number of 1892, of the *London Geological Magazine*, G. W. Bulman appears as the author of a paper on under-clays, which he terms a "Preliminary Study." It is an interesting study of the beds of clay which underlie coal deposits.

PAPERS DEALING TECHNICALLY WITH THE QUESTIONS OF ORIGIN, COMPOSITION, AND PROPERTIES OF CLAYS.

The *American Journal of Science* contains a few very important papers in connection with the subject of clays. The first of those to be mentioned here was published in 1867 in Vol. XLIII., by S. W. Johnson and J. M. Blake, on "Kaolinite and Pholerite," which the authors show to be toughened, crystallized minerals, hydrous silicates of alumina, and the basis of our clays.

A very important study of kaolinite is also to be found in the *Mineralogical Magazine* for May, 1888, London, by Allan Dick. It contains, besides a thorough study of the mineral, a number of illustrations showing the appearance of kaolinite crystals and plates under the microscope.

Another paper on clays referred to as published in the *American Journal of Science*, is in Vol. CXLII., third series, 1891, by R. N. Brackett and J. Francis Williams; it is a description of two newly discovered minerals called Newtonite and Rectorite. It is a mineralogical paper and discusses the chemical and optical character of these minerals and shows their relation to the other minerals of the kaolinite group.

Any one desiring to learn the details about the kaolinite minerals (the hydrous silicates of alumina, and the basis of clays) should turn to the last edition of Dana's "System of Mineralogy," where a full account of these minerals is given, with numerous references to other authors.

In the March number of the *Monthly Microscopical Journal*, H. C. Sorby, in his annual address, as president of the society, discusses the application of the microscope to geology, and, among other things, the microscopical character of sands and clays, the origin of the material, and the identification of the constituent minerals.

In the April, June, and July numbers of the *London Geological Magazine* of the year 1891 there is, first, a paper by W. Maynard Hutchings, entitled "Further Notes on Fire-clays, etc." It deals essentially with the scientific examination of certain fire-clays for the purpose of determining the origin of rutile needles and ot titanium, which is such a universally distributed element in clays.

In the next succeeding number of the same journal this paper is severely criticised by Major-Gen. C. A. MacMahon, and is in turn defended by the author in the number following.

The December number of this same magazine for the year 1887 contains two very interesting scientific articles on clays. The first is by J. J. H. Teal, on "The Occurrence of Rutile Needles in Clay"; the second on "The Nature and Origin of Clays and the Composition of Kaolinite," by J. H. Collins. This paper is well worth the study of any one interested in the subject, though an abstract of it would be perhaps too technical for an article of this kind.

There is an article bearing on the origin of clays in the *American Journal of Science*, Vol. XXIX., third series, 1885. It is entitled "Suspension and Sedimentation of Clays," and is by William H. Brewer. It is an excellent discussion of the subject based on experiments by the author, and calls to mind a more exhaustive treatise on the same subject, which goes into the mathematics and physics of the phenomena, by Dr. Carl Barus, which is published as Bulletin No. 36 of the United States Geological Survey, on the "Subsidence of Fine Solid Particles in Liquids."

Prof. H. O. Hofman and C. D. Demond, of the Massachusetts Institute of Technology, have published this month, in the Transactions of the American Institute of Mining Engineers, an account of some experiments for determining the refractoriness of fire-clays. It discusses briefly the methods for such determinations, and describes a series of experiments made by the authors, based on the possibility of obtaining comparative results by diluting different clays with similar proportions of fluxes, and observing the effects of heat upon them under these circumstances. The method was original, and will lead to valuable results.

In the Bulletin, Nos. 5 and 6, 1887, de la Société Française de Mineralogie, is an article entitled "De l'Action de la Chaleur sur les Argiles," by Prof. Le Chatlier. It is a technical account of some experiments of his in thermo-chemical lines, the author arriving at the chemical formulæ of the clay minerals through the detection of variations in the temperature, under certain conditions, due to the release of the molecules of water from the hydrous silicate of alumina, on being heated.

A large amount of information concerning the nature and properties of clay is to be found in the publications on soils of Prof. Milton Whitney, of the Maryland Agricultural Experiment Station.

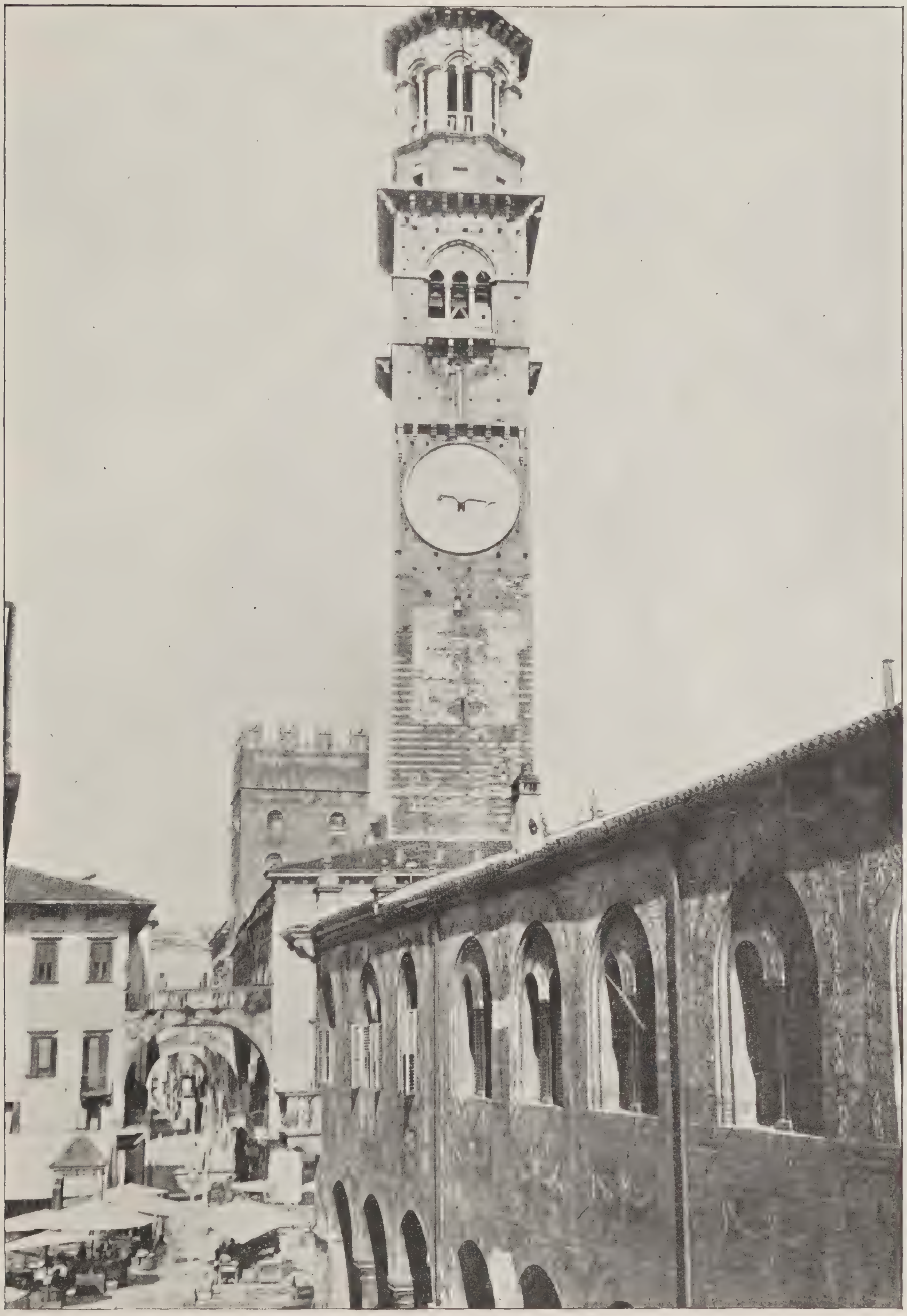
GERMAN PUBLICATIONS.

There are many publications in the German language on the subject of clays of exceeding value. Among these perhaps the two most important single publications are those respectively of Bruno Kerl, entitled "Handbuch der gesammten Thonwaarenindustrie," published in 1879, and that of Carl Bischof, entitled "Feuerfesten Thone," published in 1876, a new edition of which is said to be now in print. They are works which should be in the library of every clay manufacturer understanding the German language.

The German periodical devoted to clay industries, and entitled *Thonindustrie Zeitung*, is probably the most thorough in its treatment of subjects interesting to clay workers of any similar journal published in the world.

This brings to an end the list which the writer had in mind on beginning this sketch. It might be perhaps indefinitely enlarged, but without further trespassing on the field covered by the bibliography of Champfleury, described above, or looking to the languages which are but little used in this country, it seems to the writer that there is here a line of demarcation, containing the group of works discussed, and separating them from a mass of similar literature, which is mostly of less importance to the general reader. If among a thousand references which the writer has at hand, there are many deserving recognition in a sketch of this kind, which have been omitted here, the cause may have been either the writer's oversight or judgment in the matter.

George Edgar Ladd.



CAMPANILE OF THE PALAZZO DEI SIGNORI, VERONA.
Supplementary Illustration to "Brick and Marble in the Middle Ages."

BRICK AND MARBLE IN THE MIDDLE AGES.

(*Continued.*)

CHAPTER VI.

> "Come, go with me. Go, sirrah, trudge about
> Through fair Verona."
> — *Romeo and Juliet*, act i., scene 2.

VERONA: CAMPANILE OF THE PALAZZO DEI SIGNORI — STA. ANASTASIA — MONUMENTS — PIAZZA DELL' ERBE — THE DUOMO — THE BAPTISTERY — STA. MARIA L'ANTICA — CEMETERY AND PALACE OF THE SCALIGERS — DOMESTIC ARCHITECTURE — PIAZZA DI BRÀ — THE AUSTRIANS — PONTE DI CASTEL VECCHIO — SAN ZENONE — SAN FERMO MAGGIORE — CHAPEL NEAR THE DUOMO — ROMEO AND JULIET — DWARFS — WELLS.

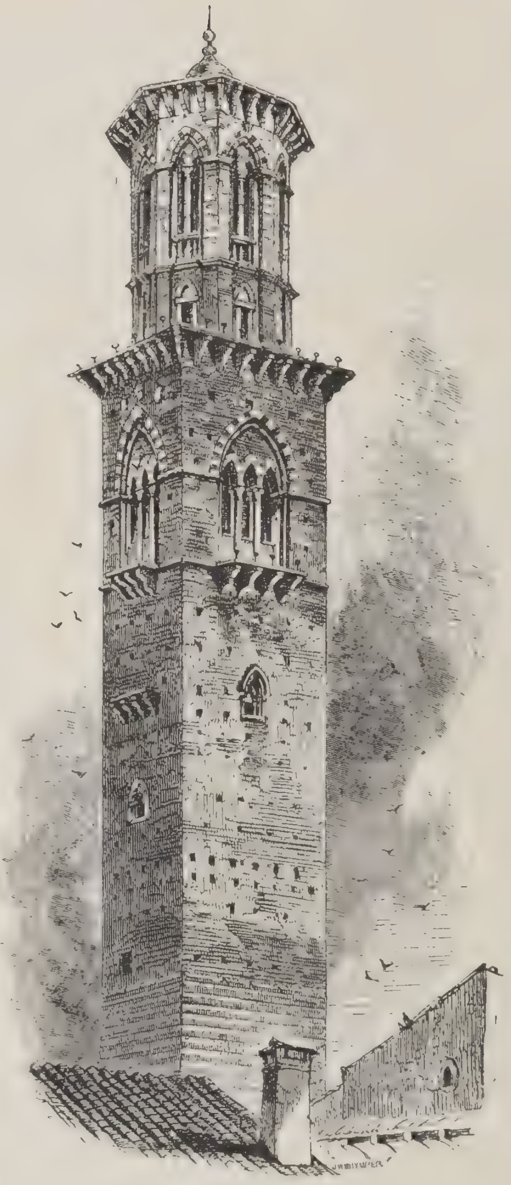
WE reached Verona in the evening, and were up early on the next morning, anxious to get a general idea of the city. But I was no sooner out of my bed than I saw from my window, over the roofs of the opposite buildings, the Campanile of the Palazzo dei Signori, a lofty, simple, and almost unbroken piece of brickwork, rising, I suppose, at least three hundred feet into the air, and pierced with innumerable scaffold holes, in and out of which, as I looked, flew countless beautiful doves, whose choice of a home in the walls of this tall Veronese tower will make me think kindly of putlog-holes for the future. Certainly, if the Italian and English principles of tower-building are to be compared with one another, the Italian need give no fairer example of its power than this simple, grand erection.

It rises, as we found afterwards, out of a large pile of buildings, and for a short distance above their roofs is built in alternate courses of brick and a very warm-colored stone, and then entirely with brick, pierced with only one or two small openings, and terminating with a single belfry-stage; the belfry windows, with their arches formed without mouldings, and with the sharp edges only of brick and stone used alternately, are divided into three lights by shafts of shining marble; the shafts, being coupled one behind the other, give strength with great lightness, and are very striking in their effect. These windows have, too, remarkably large balconies, but without balustrading of any kind. The upper and octangular stage of the campanile is comparatively modern, but rather improves the whole effect than otherwise.

I could hardly tear myself away from this noble work; but much more was to be seen, so I dallied not long before I set forth on a journey of discovery, giving myself up gladly to sketching and ecclesiology.

The hotels of Verona are both of them near Sta. Anastasia, and at the eastern end of the long and, at first, narrow and picturesque Corso. The Adigè separates the city from its eastern suburb, and from the hills crowned by the Castel San Felice and the picturesquely stepped city walls. Its yellow waves wash with an angry rush the foundations of the houses which overhang it all along its course, but the only views of it are to be obtained from the bridges and from the open space near the Castel Vecchio. At the extreme northwestern angle of the town stands the church of San Zenone. One soon finds one's self constantly on the Corso, and to the north of this lie the cathedral Sta. Eufemià, the Castel Vecchio, and San Zenone: whilst to the south of it are the tombs of the Scaligers, San Fermo Maggiore, the Roman Amphitheatre, and the Palazzo Publico. Without further attempt to describe the map, let us visit the buildings, of which the list I have given, though by no means exhaustive, includes the finest.

The Veronese architects in the Middle Ages were certainly some of the best in Italy. San Zenone is by very much the finest church of its kind that I know; Sta. Anastasia is, on the whole, one of the best churches of a later date; and San Fermo Maggiore affords some of the best detail of brickwork; and the tombs of the Scaligers are the best examples of monuments in all Italy.



The first thing seen on turning out of the hotel is the west front of Sta. Anastasia* looking so beautiful at the end of the narrow street, whose dark shade contrasts with the bright sunshine which plays upon its lofty arched marble doorway and frescoed tympanum, and lights up by some kind of magic the rough brickwork with which the unfinished church has been left, so brightly, that, as you gaze, thoughts pass across your mind of portions of some lovely painting, or some sweeter dream; you feel as though Fra Angelico might have painted such a door in a Paradise, and as though it were too fair to be real. There, however, it is, rich and delicate in color, shining with all the delicate tints of the marbles of Verona, pure and simple in its softly shadowed mouldings, beautiful in its proportions, and on a nearer approach revealing through the dark shade of its opening, and over and beyond, the people, who early and late throng in and out the vague and misty forms of the solemn interior.

Sta. Anastasia is one of the most complete and representative pointed churches in the North of Italy, and deserves, therefore, a rather detailed description. Its date is about 1260 to 1290. The ground plan is very simple — a nave of six bays, then one which is the crossing of the transepts, a very short choir of one bay finished with an apse, and two chapels on the east side of each transept. The nave aisles are narrow, and the whole design is characterized by intense simplicity of detail and arrangement. The width of the nave, and the height of the columns and arches, give, on entering, an idea of vast space and size. The columns are very simple, cylindrical in section, and support arches built of brick, and only chamfered at the edge; from the caps of the columns flat pilasters run up to the commencement of the groining, and above the nave arcades there are two small circular openings, one in the place of a triforium, opening into the roof of the aisle, the other above it and larger, filled in with plate tracery in stone, and forming the clerestory.

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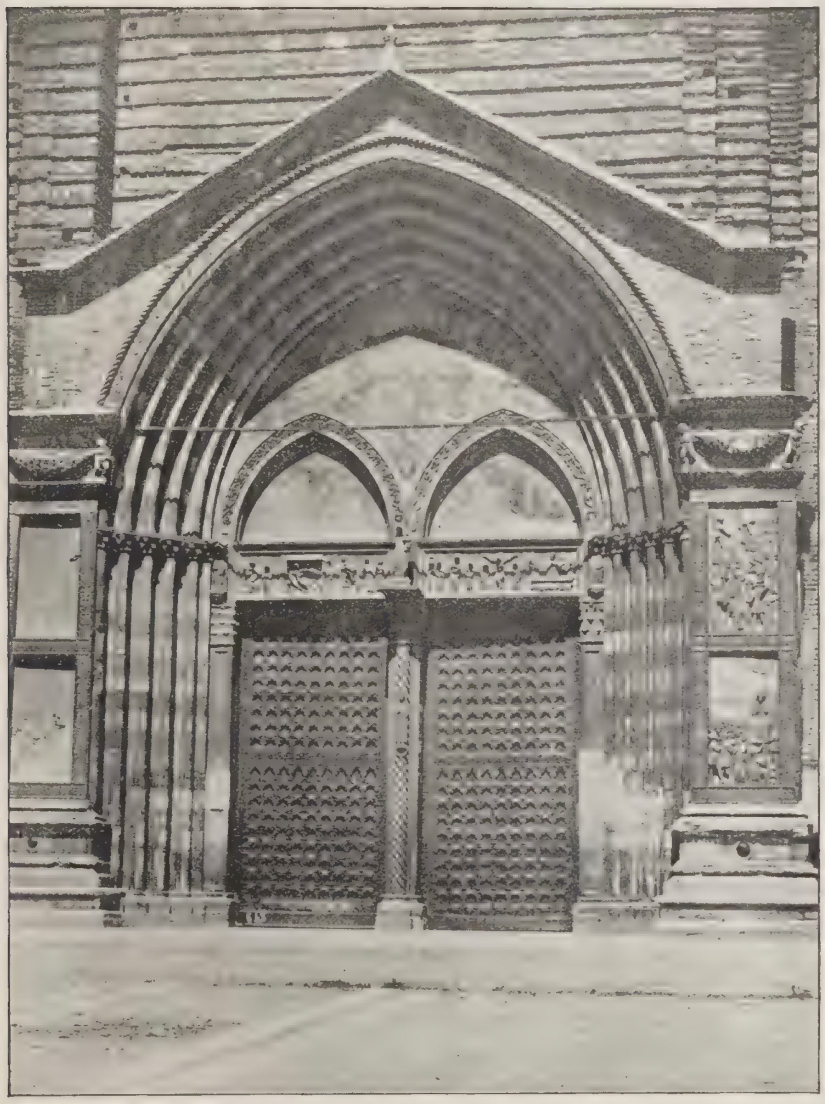
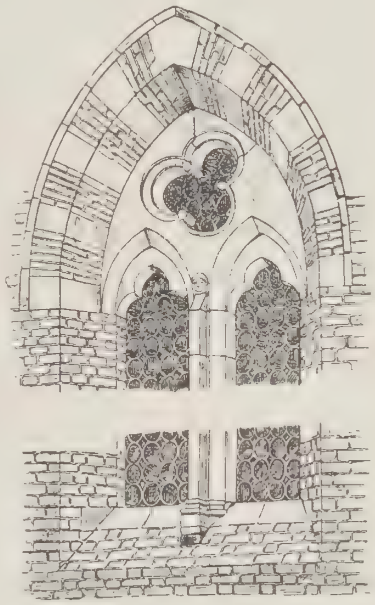
*A photograph of this will be published in the next issue.



WEST DOORWAY, STA. ANASTASIA, VERONA.
SUPPLEMENTARY ILLUSTRATION TO "BRICK AND MARBLE IN THE MIDDLE AGES."

But if the walls are beautiful in their color, not less so is the pavement, which, from one end of the church to the other, remains to this day to all appearance just as it was on the day that the church was finished. The nave and transepts are all in one pattern; the spaces between the columns in a variety of beautiful designs, and divided from the nave and aisle pavements by a strip of white marble on each side; and the aisles again are on the same scheme throughout. The colors of the marble used are white, red, and bluish gray, and the patterns very simple and generally geometrical in outline; and there is a quiet richness of effect in their arrangement which is exceedingly beautiful. Such a pavement must unhappily be forever Italian, and we in England can scarce hope ever to attain to anything so exquisite; but we do not well to forget that by the mixture of a small quantity only of marble with our encaustic tiles we should attain to much greater beauty of effect than we can by the use of tiles alone, and there are many towns, as, *e. g.*, Plymouth, the very pavement of whose streets is of a material which might most advantageously be introduced, more often than it has yet been, inside the walls of our sanctuaries, as well as under the feet of every passer along the streets.

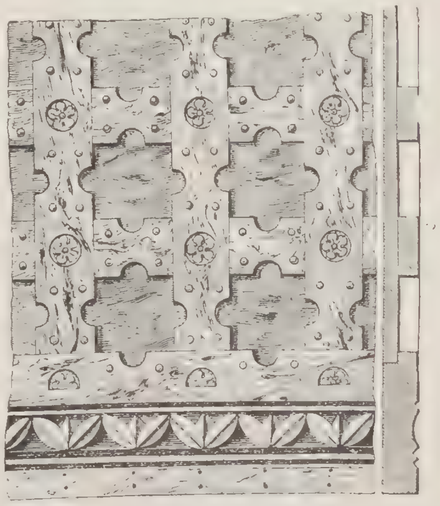
There are some monuments and paintings here quite worth looking at. The Pellegrini Chapel, next to the choir, has two fine trefoil-headed monuments in red marble with the background painted with subjects of about the same age (*circa* 1392); and in the Cavalli Chapel there is an admirably painted wall, against which has been put a monument which, though somewhat rude and coarse in its sculpture, nevertheless produces a very fine effect of color and architecture combined.*



The window tracery of Sta. Anastasia is rather singular plate tracery, consisting of mere piercings through the stone with very little moulding; most of the windows are of two very lofty trefoiled lights with circles and trefoils pierced above, very simple and severe, and remarkable for the quaint way in which the cusping is arranged, not with some reference to vertical lines, as is ordinarily the case with us, but just as fancy or chance seems to have dictated. The clerestory windows are circular openings cusped.

There is a curious but not very happily treated arrangement inside, — a step all round the inside walls, projecting some three or four feet from them, and panelled all round against the riser with a small trefoil arcading — the whole in red marble.

Externally, the church is almost entirely built in red brick, with rich cornices and rather ungainly buttresses and pinnacles of brick; the windows have brick jambs with stone tracery, and on the north side of the choir is a fine, lofty campanile, finished at the top with a low, very plain, and octangular capping, and unpierced with openings, except in the belfry stage. Of the west front only the doorway has been completed; this is in courses of red, gray, and white marble, and most effective; the rest of the front is left in brick, finished exceedingly roughly, with a view to leaving a key for the marbles with which, no doubt, it was intended to veneer the entire front. The wooden framework of this door, of which I give a detail, is very curious; it is of deal, coeval with the doorway, and the framework is external, not internal.



(*To be continued.*)

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* An extremely careful chromo-lithograph of this wall and monument has been issued by the Arundel Society, accompanied with a notice of both, written by Mr. Ruskin.

VIEW OF THE REAR OF STA. ANASTASIA, VERONA.
Supplementary Illustration to "Brick and Marble in the Middle Ages."

THE ART OF BUILDING AMONG THE ROMANS.

Translated from the French of Auguste Choisy by
Arthur J. Dillon.

CHAPTER II.

CONSTRUCTION OF RUBBLE VAULTS.

RUBBLE vaults were nowhere in such general use as among the Romans, and the ruins of their edifices are filled with the debris; everywhere masses of rubble boldly thrown into space are found covering the ancient halls, or where they have been destroyed the fragments of overhanging masonry still stand as witnesses of the original structure, and mark for us the vaults which time has overthrown.

These vaults, formed of small materials, were of infinite variety and one sees them covering rectangular and polygonal spaces, rotundas and exedras, for being, as it were, moulded, they could be adapted to the most varying forms, and could be made to meet all of the most numerous requirements of planning. Many of them, moreover, seem to have been made to defy centuries, and the majestic simplicity of their forms imparted to the edifices a severe grandeur most expressive of the great Roman power. There has never been a style of architecture better adapted to the moral and material needs of a people, and one can comprehend why the Romans founded their entire architecture on this system.

The problem of replacing wooden scaffolding by constructions at once more durable and more solid is as old as the art of building; but before the appearance of rubble vaults no really practical solution was known. The stone tiling or lintels of the Egyptians and Grecian temples required materials hard to quarry and expensive to work. In early architecture one comes across some vaults made of overhanging rows of stones; one even finds vaults composed of keys, the joints converging to a horizontal axis, but through ignorance or system the builders of primitive times nearly always laid the keys of their vaults dry, interposing between the blocks no cement, mortar, or other material to compensate for the irregularities of the stones. For this reason they were obliged to make them very exact in form, and thence arose difficulties which evidently limited the applications to which cut-stone vaults would otherwise have been susceptible. Of the ancient people the Etrurians were those who made the greatest use of cut-stone vaults, but even they used them to no great extent. They vaulted sewers, the subterranean drains of marshy plains, aqueducts, and the gates of their towns, but never the buildings adapted to domestic life or even their religious edifices. For these they used wooden beams like those of the Tuscan temple described by Vitruvius, or stone architraves similar to those imitated in the façades of some of the still existing rock-cut temples.

In spite of their constant intercourse with Etruria, the Greeks do not seem ever to have thought of imitating the vaults with radiating joints which the Etruscans used. In the primitive Greek buildings at Mycene, and more often in those of the island of Eubœa, one finds vaults made by corbelling, but before the Roman conquest the Greeks never accepted vaults with radiating joints. Their architects had given the highest expression of the ideas of regularity and order to the construction with lintels, and to these forms they were attached as being the most beautiful creations of their genius, a part of their national glory, and they kept to them as long as their independence lasted. So that though they witnessed the rise of vaulted construction they took no part in it, and left to the architects of Italy the honor of making of it a general system, simplified and rendered practicable by the employment of small materials artificially combined.

The Romans may or may not have been the inventors of rubble vaults, that is to say, of vaults of small stones bound together by mortar, but at any rate no one before them thought of constructing vaults of large span of such material. For a long time they themselves seem to have been ignorant of or to have neglected the resources which this system of construction offered, and we do not find it generally used until the last century before the Christian era. It seems to have been developed during the period of material prosperity which followed the foreign conquests and the quelling of civil discord. Its progress was then very rapid, and a veritable revolution took place in the art of building. Once that vaults were adopted for covering great halls, an entire change of plan became necessary, for the grouping of the halls had to be changed in order to obtain sufficient abutment to the thrusts, and the points of support, subject to a new system of strains, took entirely new forms. Up to this time the Roman architects had, so to speak, lived on the stores of the Greeks and Etruscans, and it was not until this period that processes of building were freed from the fetters of tradition, and that an entirely new system of construction, really Roman, was born, or, at least, was formulated and made general.

Doubtless the transformation accomplished during the last days of the Republic had been in preparation a long time; but either because, during the long intervals which separate us from the Romans, the first examples of vaulted construction have disappeared, or, as would seem more probable, have given place to the more sumptuous edifices erected by the emperors, all traces of the interesting series of attempts and improvements which preceded the reign of Augustus have been effaced. The Pantheon presents itself as the masterpiece of Roman art, and at the same time as one of the first monuments of its history, for examples of a previous date are too few or too uncertain to mark the gradual progress of the art of building during the Republic. We shall not try to establish its origin and progress by conjectures, but shall at once examine the completely developed rubble vaults; we shall give the circumstances of their construction, and try to connect them by a few simple ideas which seem to dominate the whole Roman system of vault building.

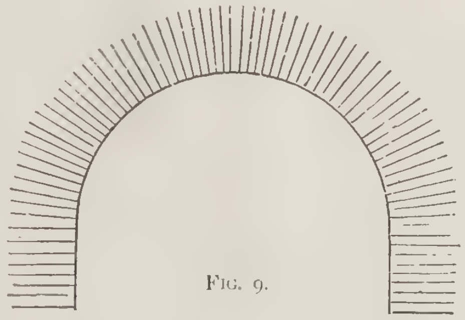


FIG. 9.

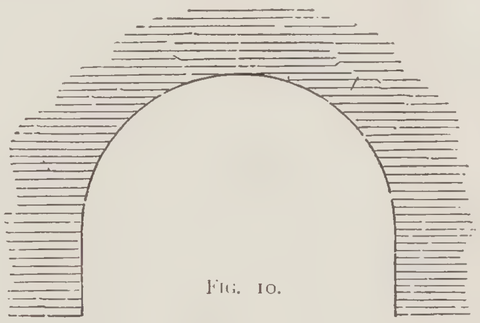


FIG. 10.

If one examines an edifice vaulted with rubble, for example, one of those long lines of aqueducts which cross the Roman Campagna, he will perceive on the face an arch of brick or stone with radiating joints, and behind these principal arches a rough masonry made of fragments of tufa or a debris of tiles, resembling bèton. In other words, a summary inspection of the ruins seems to reveal a compact mass of rubble, enclosed by two revetments with radiating joints. But if one examines these masses of masonry more closely, which at first sight seem to be rough and crude, he discovers courses of an entirely separate construction embedded in them, real ribs, sometimes entire networks of brick forming skeletons in the body of the rubble, slender frames which branch out and extend through the midst of the rough masonry which encloses them.

This skeleton must not be considered as a series of resisting arches, built at the same time as the rubble and intended to strengthen it, as something analogous to the courses of stone in modern buildings. The chains of brick embedded in the Roman vaults were built first, the rough masonry being made subsequently, as is shown by the lack of accordance between the courses of brick and the courses of rubble. (Fig. 8.)

This light frame or skeleton embedded in the vault, as well as the principal arches which terminate it, is made of bricks, with radiating joints, and to a certain extent its construction resembles, in this respect, that of our masonry vaults. The likeness ends here, however, and if we leave the interior framework of the vaults to examine the rubble itself, we shall find in its mass a simplicity of construction entirely different from any modern methods.

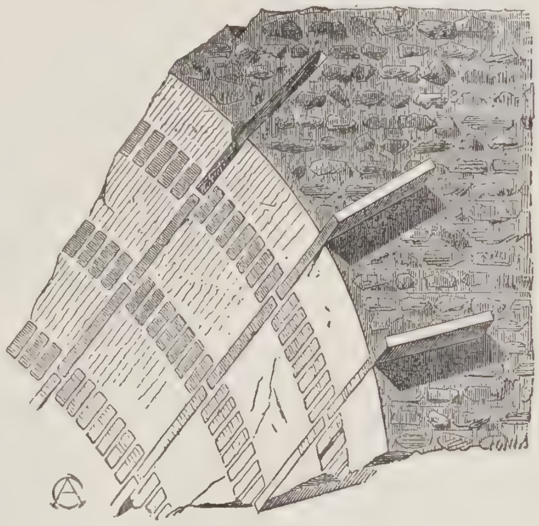


FIG. 8.

The word "vault" gives the idea of a structure where the joints are all directed towards a common centre, and this, in fact, corresponds to the structure of Roman vaults of cut stone with dry joints, and also, as we have just shown, to that of the brick arches found in the middle of the masonry like strong skeletons; but the idea is quite inapplicable to the rubble itself. The courses forming the body of a Roman vault of rough rubble are exactly horizontal from the springing to the summit, and seeing these beds so plainly marked in the ruins, one thinks involuntarily of the layers which are sometimes so clearly marked in a section of stratified earth. The arrangement of the joints and of the courses is so unusual that it may be useful to make it clear by a drawing, and I therefore compare in two sketches the interior appearance of vaults constructed after each system.

The direction of the joints of a modern vault are as indicated in the first figure, and Roman vaults of dry-laid cut stone were also built this way; but in a Roman vault of small cemented materials the direction of the joints was, on the contrary, that represented by the second. (Fig. 10.)

Thus, according to whether they built in cut stone or small cemented materials, the Romans made the joints radiating or perfectly parallel. These two different systems do not imply any incoherence or any contradiction in ancient methods, for the conditions of equilibrium in vaults of dry-laid stones and in those of rubble were profoundly different. In one case the stones held only by reason of their shape, and, therefore, their joints had to be made to radiate; in the other, where the agglomerated material made one solid block of the whole, the beds of mortar and beds of stone were united in one continuous and homogeneous mass, and in respect to stability the direction of the courses was of no consequence. The Romans profited by this to introduce a great simplification in their works, boldly freeing themselves from conditions which were imposed by radiating joints. Hence it is that the masonry of their vaults is nothing else than an overhanging continuation of the imposts; and, omitting the frame work imbedded in the rubble of the vault, there remains a mass of masonry exactly like the walls which support it, in so far as the direction of the courses are concerned.

(*To be continued.*)

RECENT BRICKWORK IN AMERICAN CITIES

NEW YORK.

A DESCRIPTION of the brick and terra-cotta work of the past five years in this city would be almost a résumé of the building operations during that time, for the noticeable structures in which brick or terra-cotta is not an important factor are few and far between.

At a conservative estimate, ninety per cent of the buildings in process of erection at the present time are brick and stone, or brick and terra-cotta. To write adequately concerning the latest work only would require the pages of several issues of THE BRICKBUILDER; to cover the work of five years would prevent any mention of current work, if it did not prove an endless task.

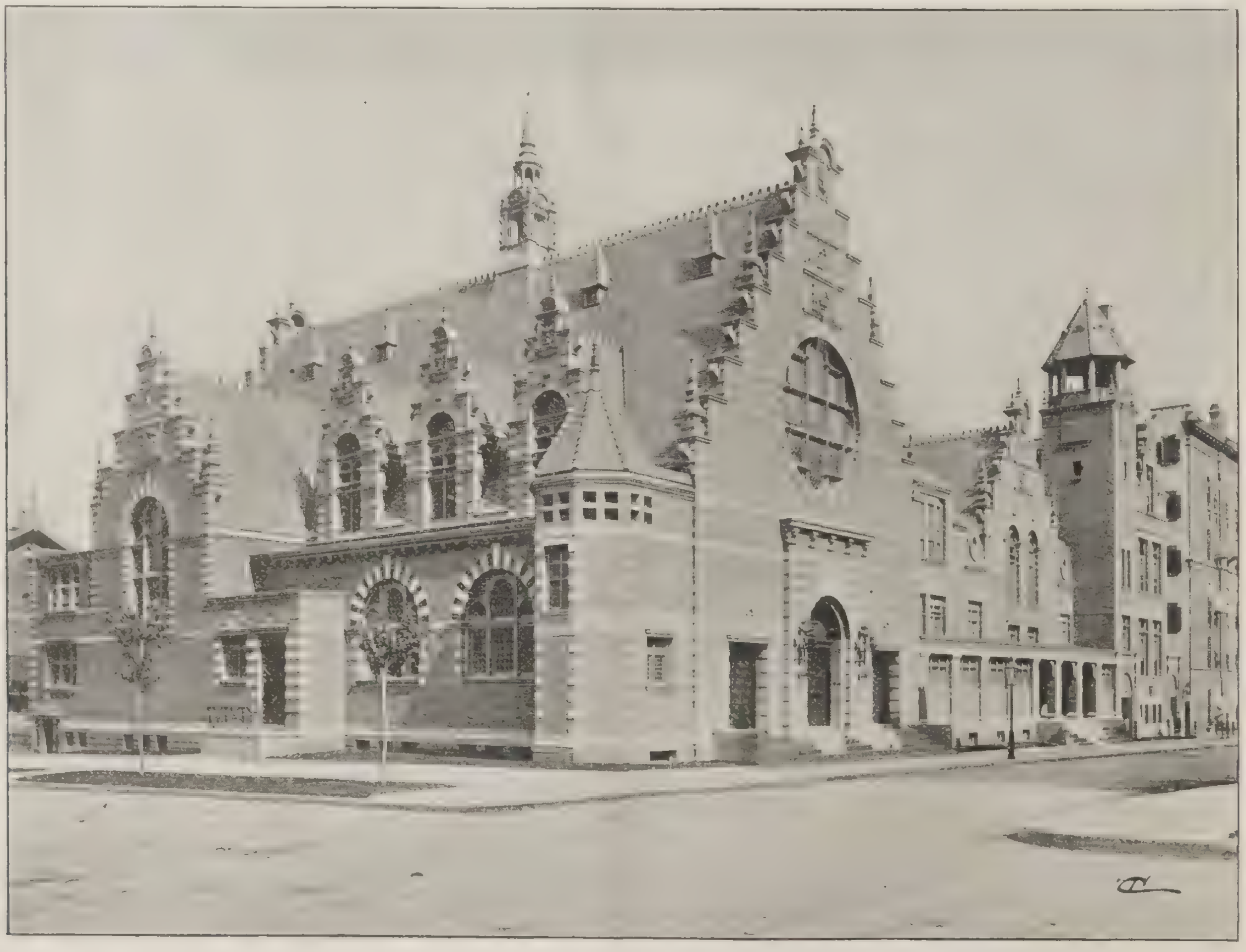
But of the older work, the best has been so well published already that it need not come within the scope of this correspondence, except when an occasional building becomes one of a group under consideration.

The most striking characteristic of recent work is the Renaissance craze which has followed the work of McKim, Mead & White, and which is extending throughout the country, just as the Romanesque craze did after Richardson's successful work. Here and there we see a really good thing, but the mass of it is mediocre, if not absolutely bad, its light color being its one redeeming feature. On this account alone, it is a welcome change from the stupid brownstone of twenty years ago. The dismal, uninviting aspect of many of our streets has been entirely transformed by the introduction of work in pleasing light color, which has broken the gloomy monotony of these rows of high-stoop brownstone fronts. Whatever their design may prove, upon individual examination, there are few that are not an improvement over the structures they have replaced.

Great as the change has been in the older parts of the city, it is not to be compared with the development of the new residential section on the west side, up town. In the matter of site, little is to be desired. It is located high above the Hudson, a bit of whose surface, with the picturesque western shore above it, closes every cross-street vista looking westward, and is bordered by Riverside Park. Much of the work already done is of a speculative character, but it is, much of it, above the ordinary, and some decidedly good, and well worth a visit.

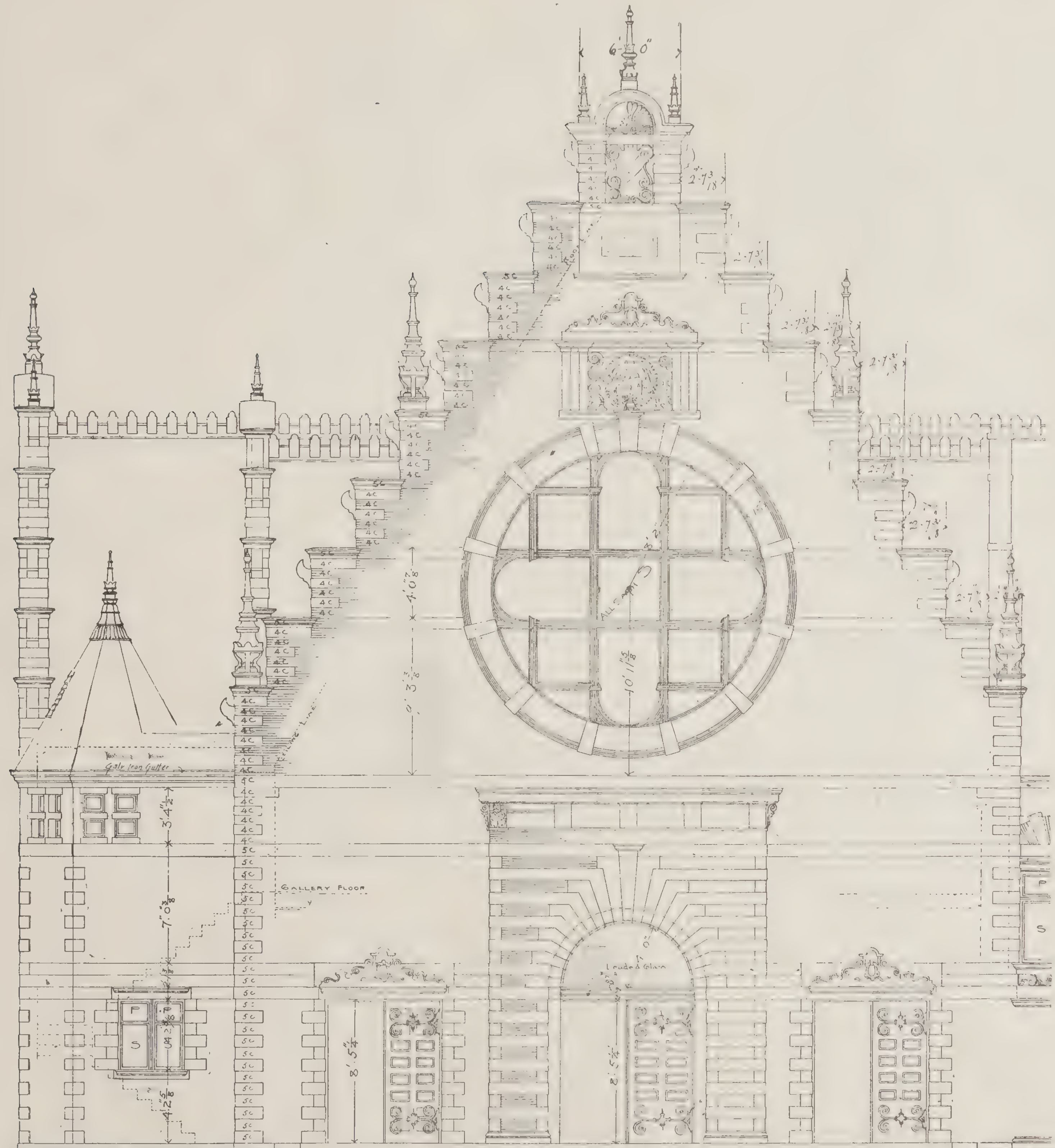
The two most striking examples in this section are so interesting and so instructive in the way of what may be done by working in the style of the Low Countries that it is worth while to give them tolerably complete illustration. There are other buildings in process of erection that might well be classed with these, among them the St. Nicholas Club, on Forty-fourth Street; but these two are, all things considered, the best types. One is Mr. Robert W. Gibson's Collegiate Church group, on the corner of Seventy-seventh Street and West End Avenue, a photograph of which is given below, and elevations and plan on pages following. It is a trifle strong in color, and may not prove on daily acquaintance so agreeable a composition as it does on occasional inspection. The wall surfaces are of tawny speckled brick, with terra-cotta trimmings to match the body color of the brick.

The design has often been criticised as a copy of the old meat market in Haarlem, but it is a very free and liberal copy, — so much so, that there are only two or three features that are essentially similar.



WEST END COLLEGIATE CHURCH, 77TH ST. AND WEST END AVE., NEW YORK. MR. R. W. GIBSON, ARCHITECT.

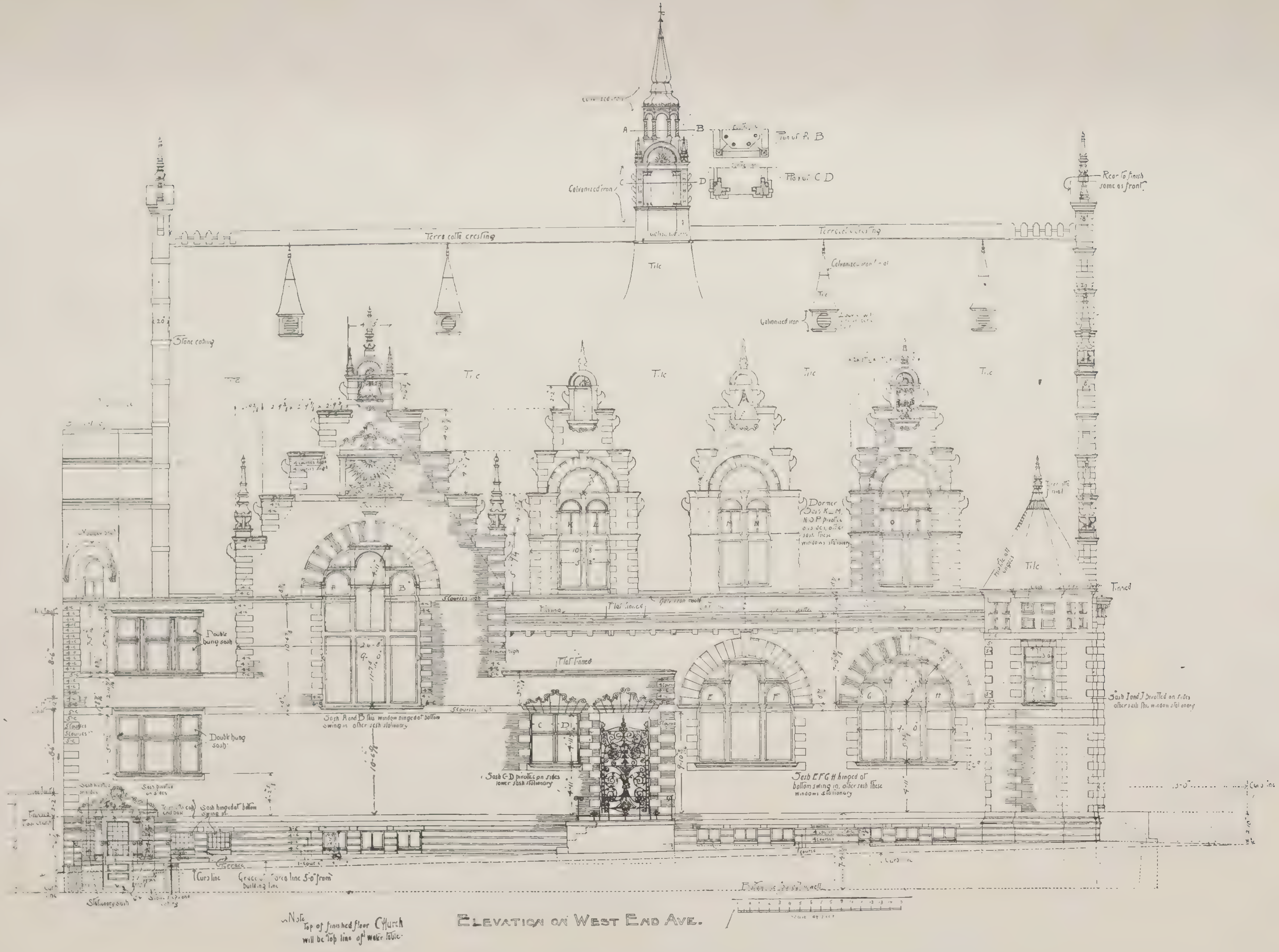
Speckled Brick supplied by Meeker & Carter, 14 East 23d St., New York. Terra-cotta made by the New York Architectural Terra-Cotta Company, 38 Park Row, New York.



ELEVATION OF WEST END AVENUE COLLEGIATE CHURCH, NEW YORK CITY.

R. W. GIBSON, ARCHITECT, NEW YORK.

BRICK FROM MEEKER & CARTER, NEW YORK. TERRA-COTTA FROM NEW YORK ARCHITECTURAL TERRA-COTTA COMPANY.

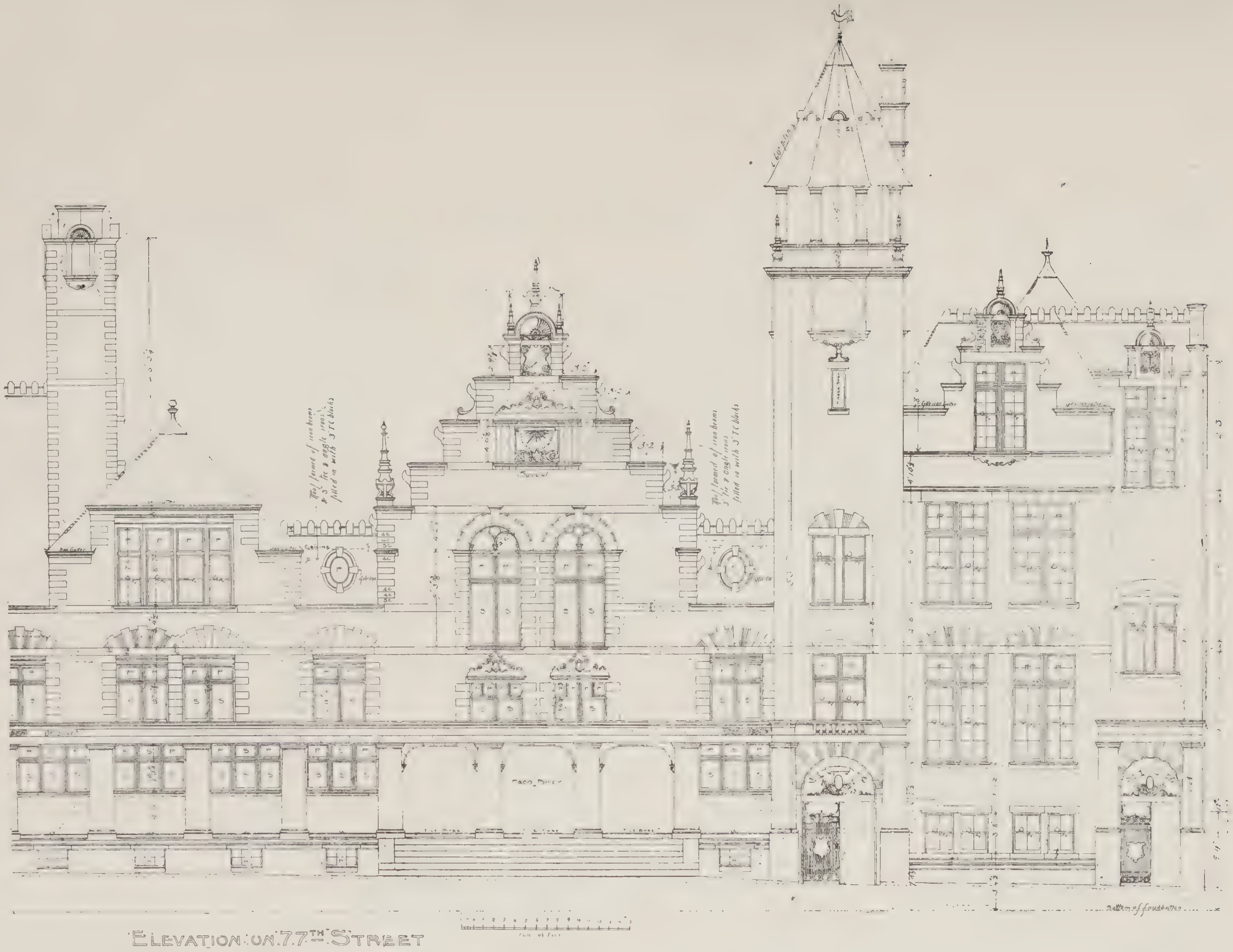

Terra cotta cresting
A
B
C
D
Plan of A B
Plan of C D
Galvanized iron
Rear to finish same as front
Tile
Galvanized iron
Stone coping
Dormer Sash K L M N O P pivoted on sides other sash these windows stationary
Tinned
Double hung sash
Sash A and B this window hinged at bottom swing in other sash stationary
Flat tinned
Sash C-D pivoted on sides lower sash stationary
Sash E F G H hinged at bottom swing in, other sash these windows stationary
Sash I and J pivoted on sides other sash this window stationary
Stationary sash
Curb line
Area line 5-0" from building line
Note Top of finished floor Church will be top line of water table
Elevation on West End Ave.

ELEVATION OF WEST END AVENUE COLLEGIATE CHURCH, NEW YORK CITY.

R. W. GIBSON, ARCHITECT, NEW YORK.

BRICK FROM MEEKER & CARTER, NEW YORK.

TERRA-COTTA FROM NEW YORK ARCHITECTURAL TERRA-COTTA COMPANY.

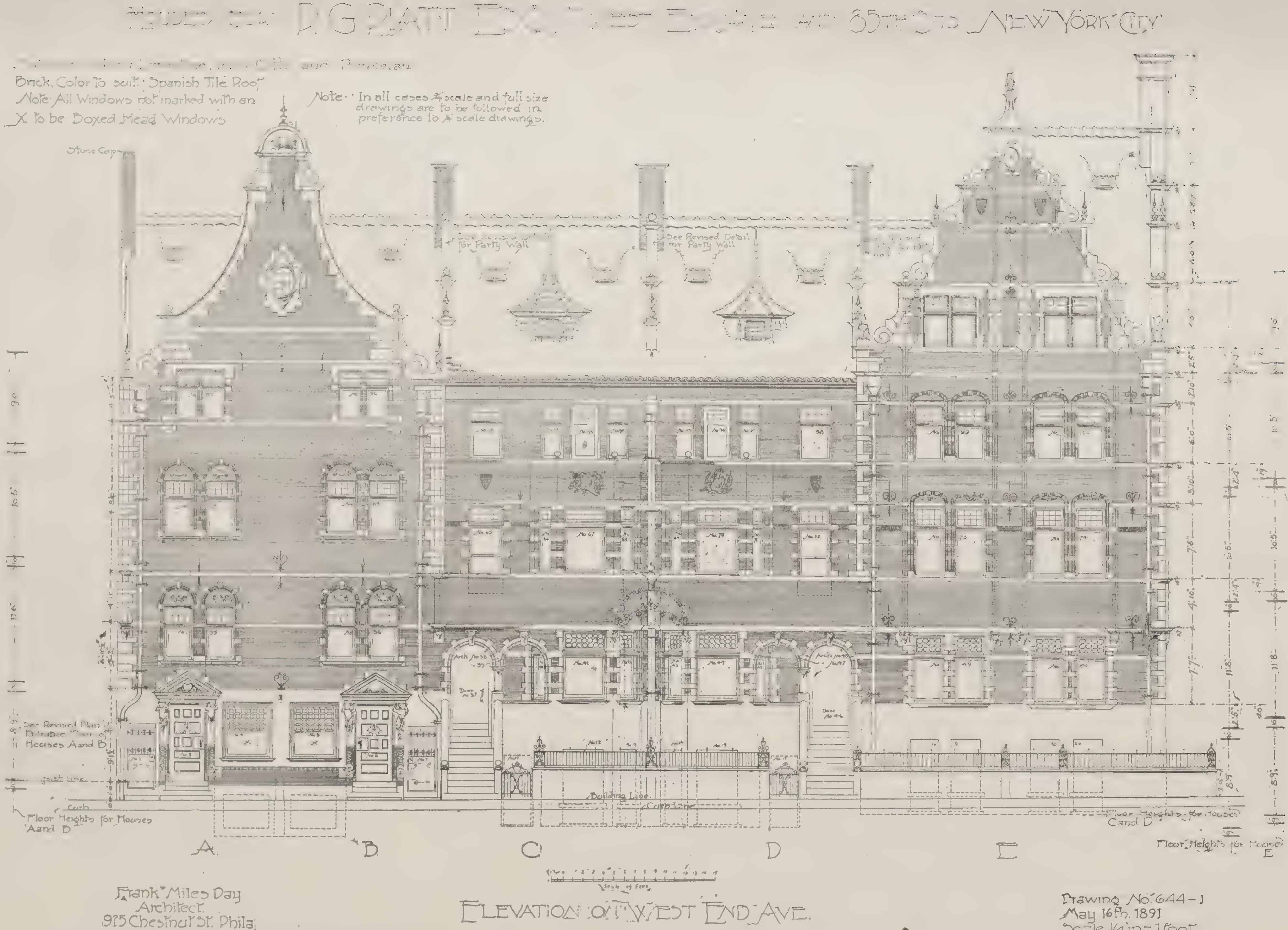

ELEVATION ON 77TH STREET
Roof formed of iron beams & 3" tee & angle irons filled in with 3" T.C. blocks
Roof formed of iron beams 3" tee & angle irons filled in with 3" T.C. blocks
Ceiling
Face Brick
Bottom of foundation
Scale of Feet

ELEVATION OF WEST END AVENUE COLLEGIATE CHURCH, NEW YORK CITY.

R. W. GIBSON, ARCHITECT, NEW YORK.

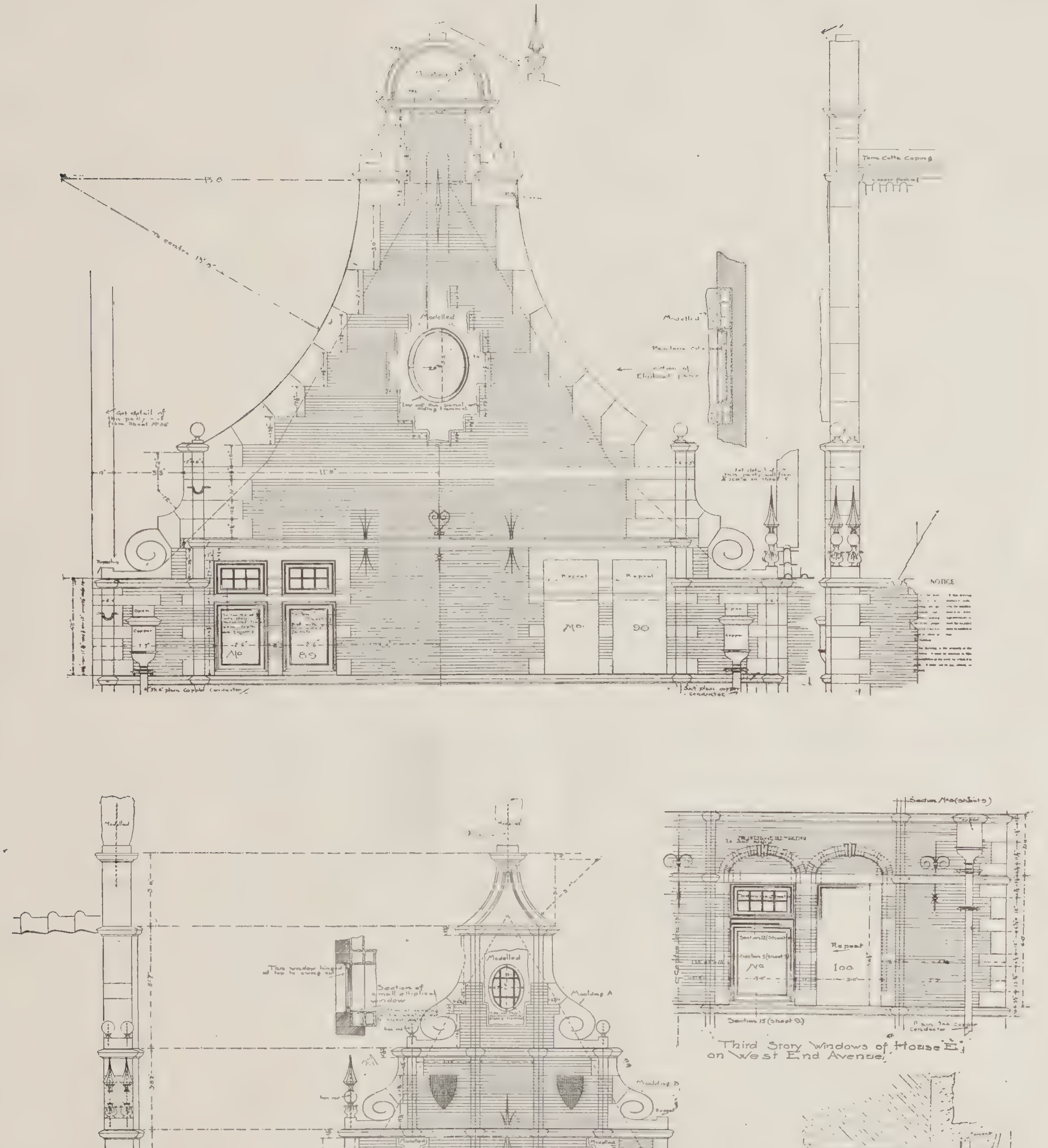
BRICK FROM MEEKER & CARTER, NEW YORK.

TERRA-COTTA FROM NEW YORK ARCHITECTURAL TERRA-COTTA COMPANY.

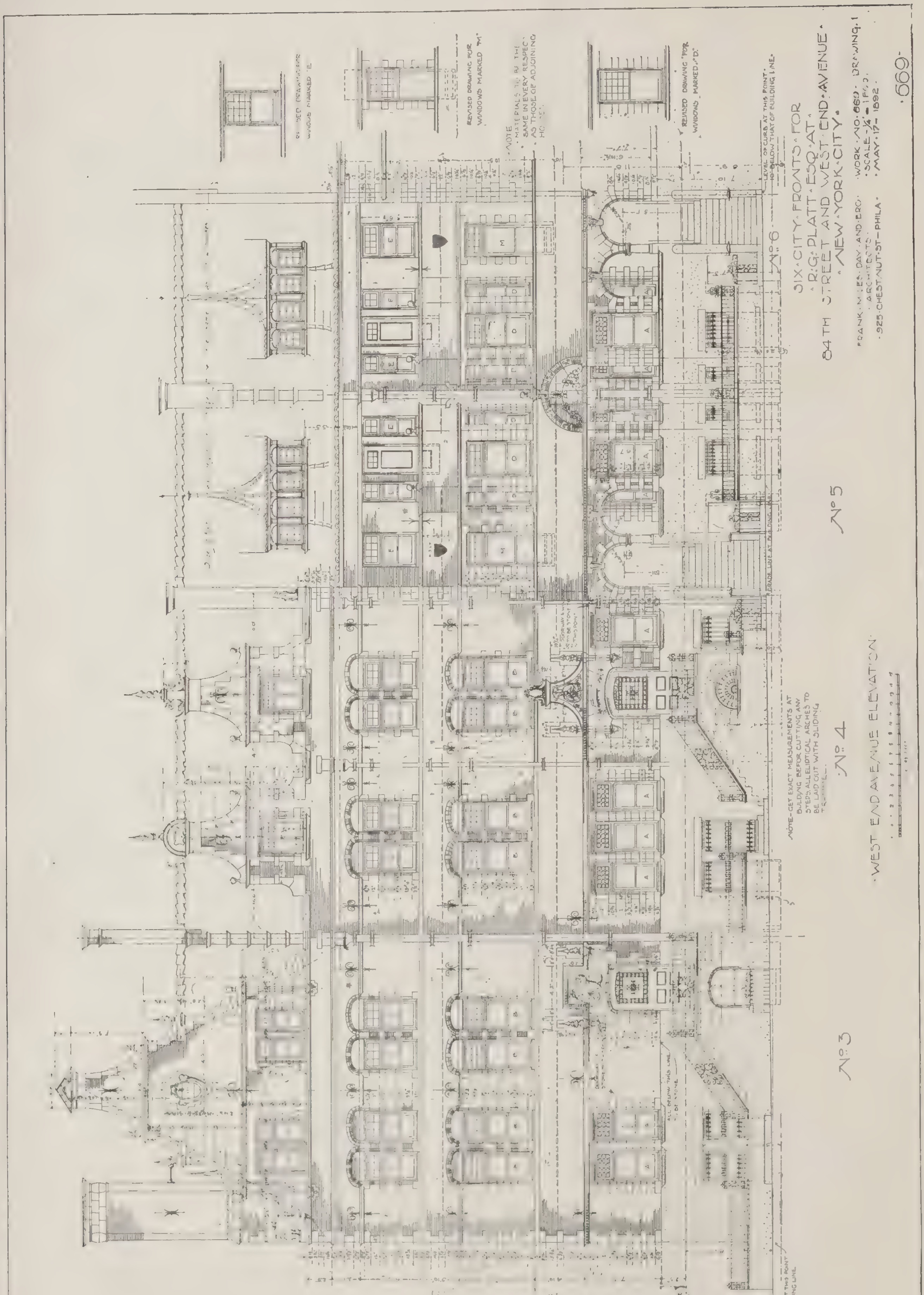

HOUSES FOR D. G. PLATT ESQ. WEST END AVE AND 85TH STS NEW YORK CITY
Brick, Color to suit; Spanish Tile Roof
Note: All Windows not marked with an X to be Boxed Head Windows
Note: In all cases ¼ scale and full size drawings are to be followed in preference to ¼ scale drawings.
Stone Cap
See Revised Detail for Party Wall
See Revised Detail for Party Wall
See Revised Plan of Entrance Floor of Houses A and B
Floor Heights for Houses A and B
Curb
Building Line
Curb Line
Floor Heights for Houses C and D
Floor Heights for Houses E
A
B
C
D
E
Scale of Feet
Frank Miles Day
Architect
925 Chestnut St. Phila.
ELEVATION ON WEST END AVE.
Drawing No. 644-1
May 16th, 1891
Scale ¼ in = 1 foot.

BRICK FROM MEEKER & CARTER, NEW YORK.

TERRA-COTTA FROM NEW YORK ARCHITECTURAL TERRA-COTTA COMPANY.


Terra Cotta Coping
Modelled
No 89
Repeat
No 90
NOTICE
This window hinged at top to swing out
Section of small elliptical window
Moulding A
Moulding B
Moulding C
Side View of Gable
Note - Roof must not be allowed to come above coping in any case
Repeat
No 100
Third Story Windows of House "E" on West End Avenue
Section No 59

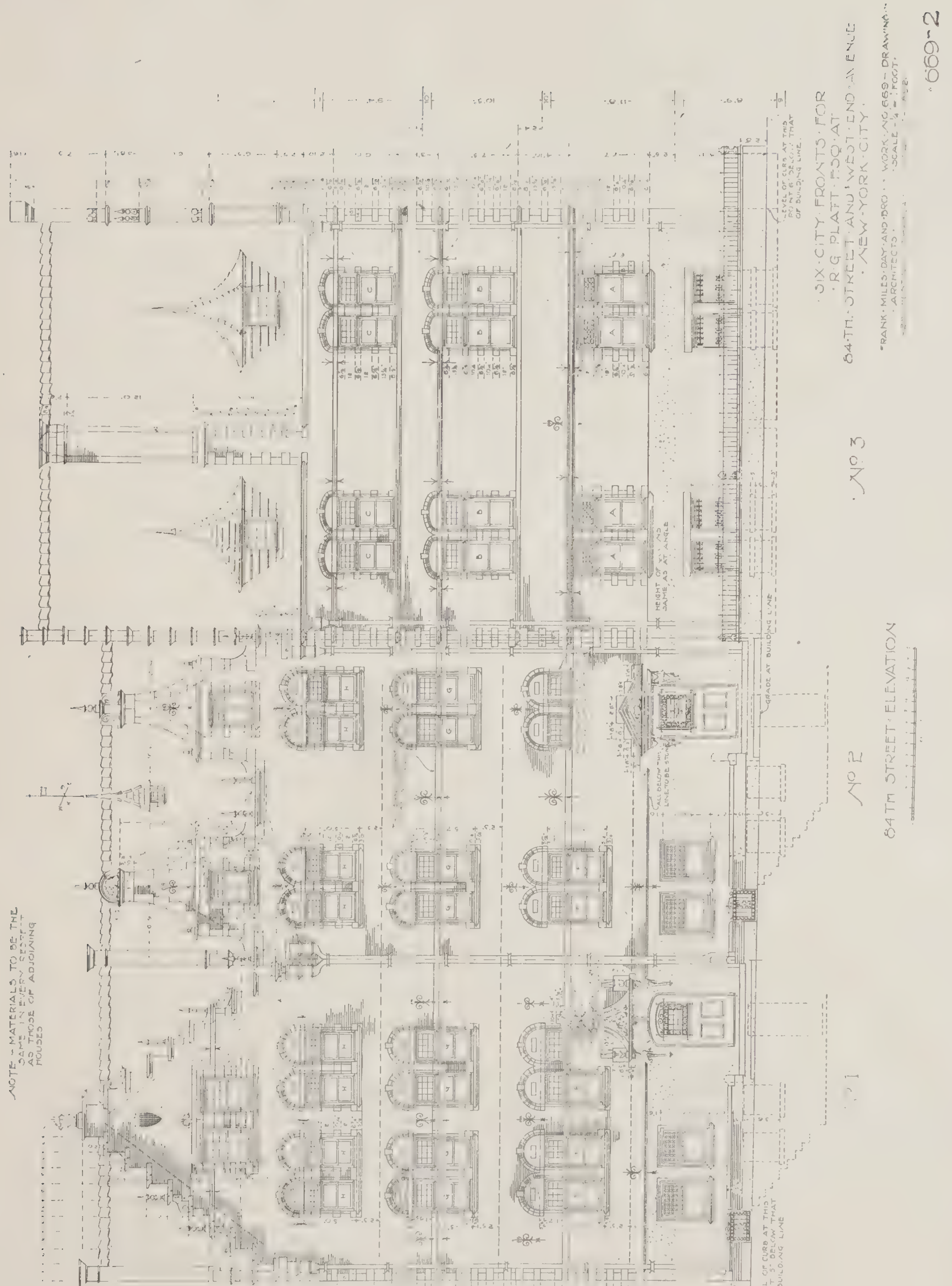
DETAILS OF GABLES ON ELEVATION ON OPPOSITE PAGE.



SIX·CITY·FRONTS·FOR
·R.G. PLATT·ESQ·AT·
84TH STREET AND WEST·END·AVENUE·
·NEW·YORK·CITY·
FRANK·MILES·DAY·AND·BRO· ·ARCHITECTS· ·925·CHESTNUT·ST·PHILA·
WORK·NO.669· DRAWING·1 ·SCALE·¼"=1 F'T· ·MAY·17·1892·
·669·
·WEST END AVENUE ELEVATION·
No 3
No 4
No 5
No 6
NOTE–GET EXACT MEASUREMENTS AT BUILDING BEFOR CUTTING ANY STEPS. ALL ELLIPTICAL ARCHES TO BE LAID OUT WITH SLIDING TRAMMEL.
NOTE MATERIALS TO BE THE SAME IN EVERY RESPECT AS THOSE OF ADJOINING HOUSES
LEVEL OF CURB AT THIS POINT 10' BELOW THAT OF BUILDING LINE
GRADE LINE AT BUILDING LINE
LEVEL OF CURB AT THIS POINT 6' BELOW BUILDING LINE
REVISED DRAWING FOR WINDOWS MARKED 'E'
REVISED DRAWING FOR WINDOWS MARKED 'M'
REVISED DRAWING FOR WINDOWS MARKED 'D'
REVISED DRAWING FOR WINDOWS MARKED 'C'
REVISED DRAWING FOR WINDOWS MARKED 'B'
REVISED DRAWING FOR WINDOWS MARKED 'A'

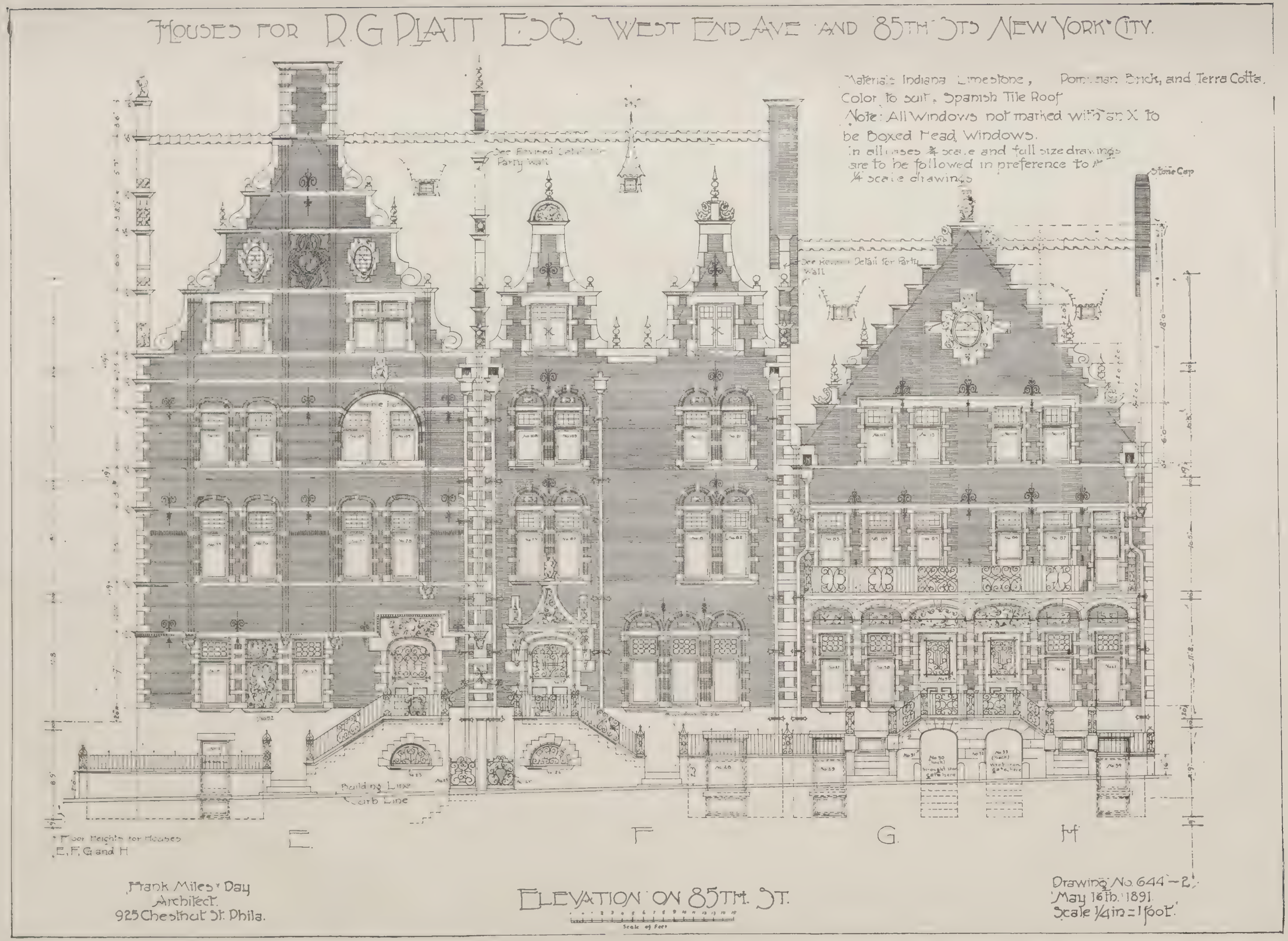
Terra-Cotta from New York Architectural Terra-Cotta Company.

Brick from Meeker & Carter, New York.


SIX · CITY · FRONTS · FOR
· R · G · PLATT · ESQ · AT
84TH · STREET · AND · WEST · END · AVENUE
· NEW · YORK · CITY ·
FRANK · MILES · DAY · AND · BRO · ARCHITECTS ·
WORK · NO 669 – DRAWING
· SCALE · ¼" = 1 FOOT ·
669-2
No 3
No 2
84TH STREET · ELEVATION
LEVEL OF CURB AT THIS POINT 6' BELOW THAT OF BUILDING LINE
GRADE AT BUILDING LINE
HEIGHT OF ... AND SAME AS AT ANGLE
NOTE – MATERIALS TO BE THE SAME IN EVERY RESPECT AS THOSE OF ADJOINING HOUSES
DOG-HEAD

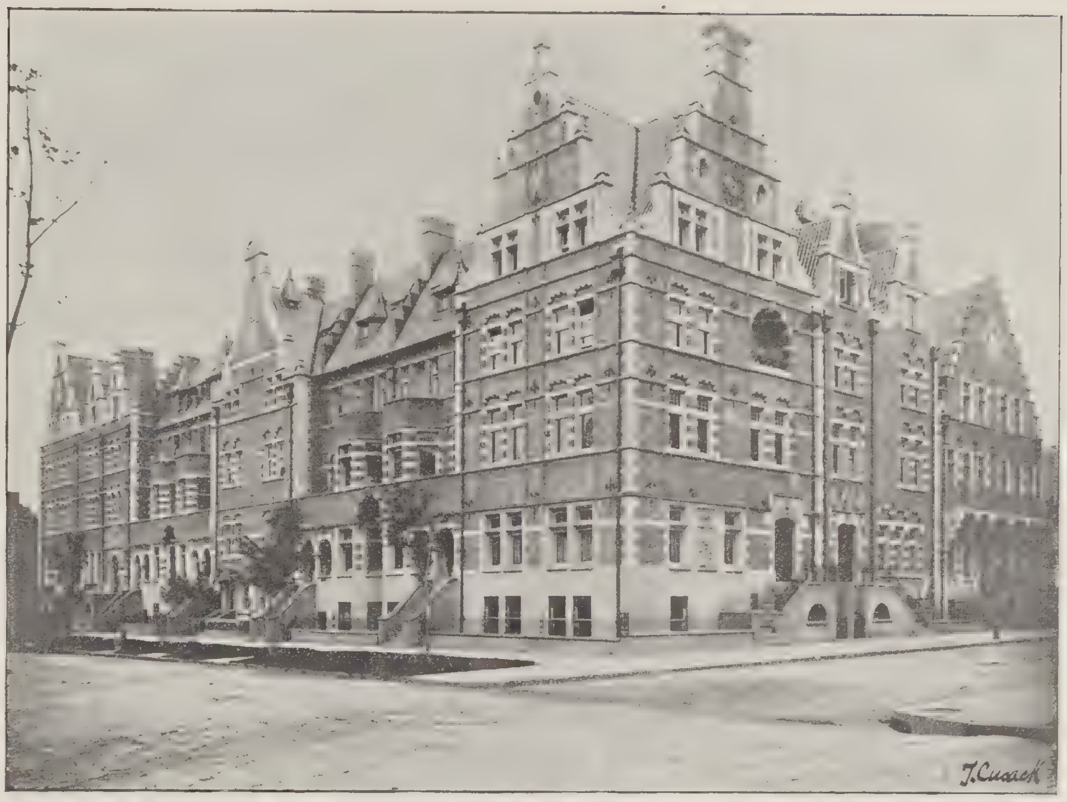
Terra-Cotta from New York Architectural Terra-Cotta Company.

Brick from Meeker & Carter, New York.


HOUSES FOR R. G. PLATT ESQ. WEST END AVE AND 85TH STS NEW YORK CITY.
Materials Indiana Limestone, Pompeian Brick, and Terra Cotta.
Color to suit, Spanish Tile Roof
Note: All Windows not marked with an X to be Boxed Head Windows.
In all cases ¾ scale and full size drawings are to be followed in preference to ¼ scale drawings
Stone Cap
See Revised Detail for Party Wall
See Revised Detail for Party Wall
Building Line
Curb Line
* Floor Heights for Houses E, F, G and H
E
F
G
H
Frank Miles Day
Architect.
925 Chestnut St. Phila.
ELEVATION ON 85TH. ST.
Scale of Feet
Drawing No. 644 – 2.
May 16th. 1891.
Scale ¼ in = 1 foot.

BRICK FROM MEEKER & CARTER, NEW YORK.

TERRA-COTTA FROM NEW YORK ARCHITECTURAL TERRA-COTTA COMPANY.



HOUSES FOR R. G. PLATT, NEW YORK. FRANK MILES DAY & BRO., ARCHITECTS, PHILADELPHIA.
Brick by Meeker & Carter. Terra-Cotta by New York Architectural Terra-Cotta Company.

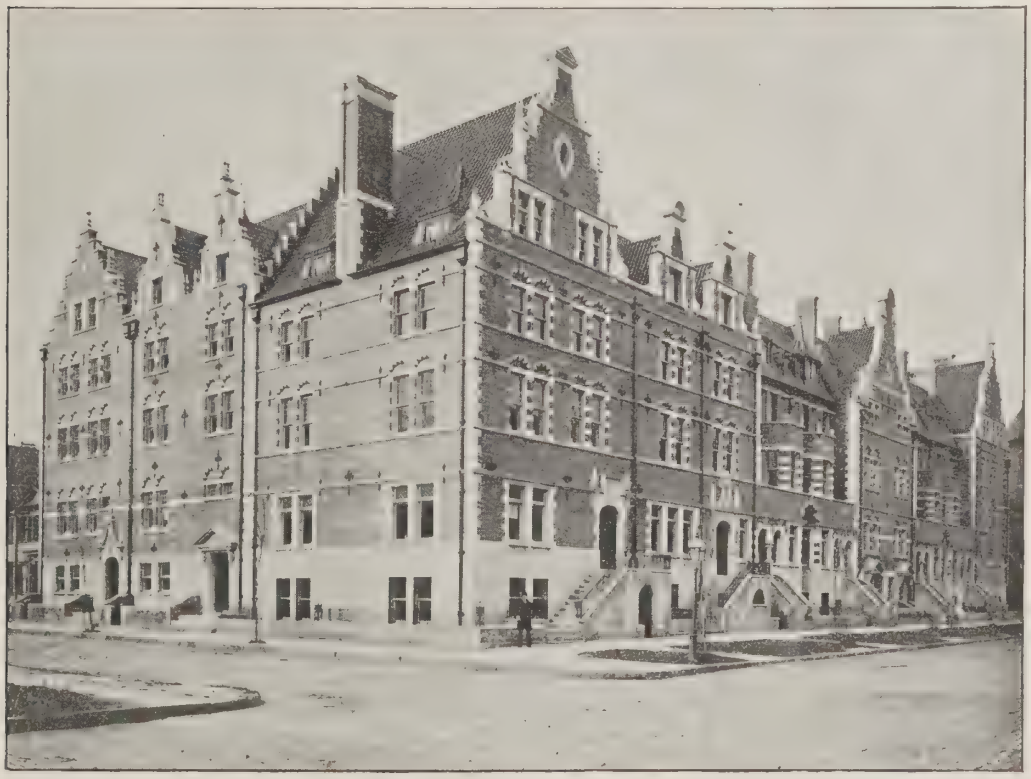
As a matter of fact, while the Fleshers' Hall, as it is sometimes called, is undoubtedly the inspiration of this West End Avenue church, there are too many points of difference to admit of any charge of plagiarism. In the first place, the requirements of plan have prevented Mr. Gibson from closely copying the Haarlem market, even had he wished to do so. The portion of the church upon the corner is the only part resembling the Dutch building, which is rectangular in plan, with three dormers almost equally spaced on the lateral façade. The nearest approach to the old building is the main entrance, which is an almost literal copy; but the large circular window is, it seems to us, out of scale, and this same fault appearing in the windows of the side elevation totally changes the character of the design. Although Mr. Gibson's detail is much less riotous, and in most instances far better than that on the old building, the general effect is not so quiet, owing to the more irregular arrangement, and the difference in scale. The church as a whole, however, is one of the most interesting and satisfactory examples of recent architecture in this city.

In the block of houses a little farther up West End Avenue, we have one of the best solutions possible of a block of dwellings, each with marked individuality, but a part of one harmonious whole. Some of the houses have high porches, others have low. Each is a composition in itself, and were these several houses scattered over New York, instead of built in one block, they would each be a noticeable example of city house architecture.

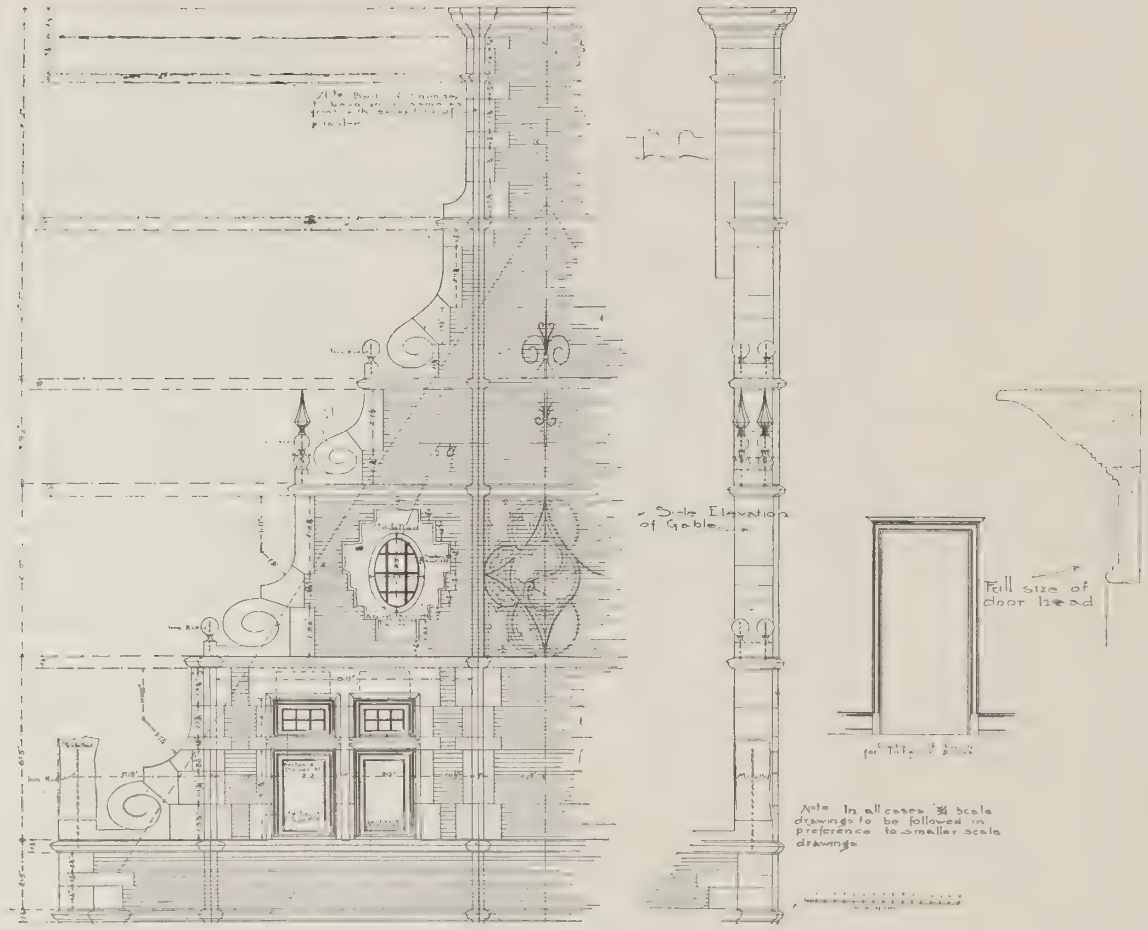
By their general character, and especially by the house on the corner of 85th Street, we are reminded of the town hall of Franeker, Holland. The drawings and details published in this number give a tolerably good idea of this work. The color is rather strong, a white terra-cotta being used, the brick being the same warm, speckled Roman brick used in the Collegiate Church. Some of the details of the terra-cotta are published also, from photographs loaned by the New York Architectural Terra-Cotta Company, who did all the terra-cotta work. An examination of this work shows the possibility of successfully using the architecture of the Netherlands as an inspiration for our own brick and terra-cotta work, and especially work of domestic character. It is picturesque enough to suit any one, it is logical, it is homelike in character, and it is essentially an architecture of clay materials.

Those readers of THE BRICKBUILDER who are particularly interested in this new Flemish work in New York will find an article entitled "The New 'New Amsterdam,'" in *Harper's Weekly* of April 21, this year. It is illustrated by a full page of photographs and drawings of the subjects published here, and several other buildings either projected or in process of construction.

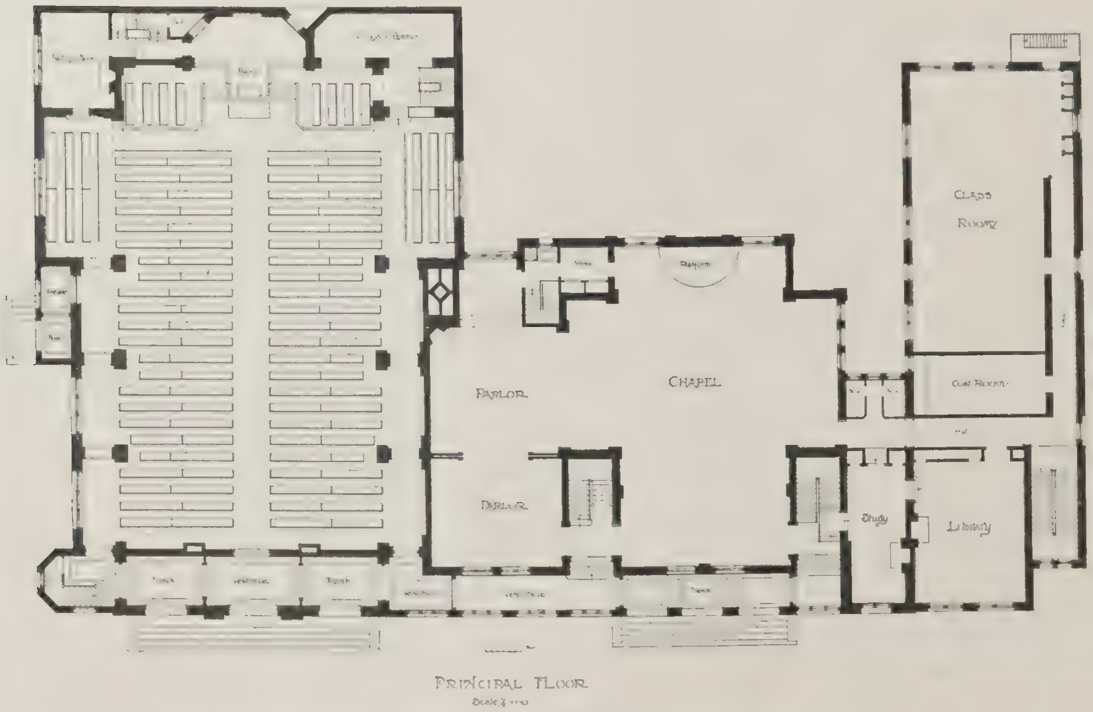
They will find Henri Havard's book, "La Hollande au Vol. d'Oiseau," with its most charming drawings by Lalanne, an almost indispensable aid in studying old Flemish work.



HOUSES FOR R. G. PLATT, NEW YORK. FRANK MILES DAY & BRO., ARCHITECTS, PHILADELPHIA.
Brick by Meeker & Carter. Terra-Cotta by New York Architectural Terra-Cotta Company.


Side Elevation of Gable
Full size of door head
Note In all cases ¾ scale drawings to be followed in preference to smaller scale drawings

DETAIL OF GABLE, HOUSES FOR R. G. PLATT, ESQ., NEW YORK.
F. M. Day & Bro., Architects, Philadelphia. See Preceding Page and Plates 44 to 48.



PLAN OF WEST END AVENUE COLLEGIATE CHURCH, NEW YORK.
R. W. Gibson, Architect, New York. See Page 106, and Plates 41, 42 and 43.

THE BRICKBUILDER.

AN ILLUSTRATED MONTHLY DEVOTED TO THE ADVANCEMENT OF ARCHITECTURE IN MATERIALS OF CLAY.

PUBLISHED BY

The Brickbuilder Publishing Company,

Cushing Building, 85 Water Street, Boston.

P. O. BOX, 3282.

Subscription price, mailed flat to subscribers in the United States and Canada	$2.50 per year
Single numbers	25 cents
To countries in the Postal Union	$3.00 per year

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Entered at the Boston, Mass., Post Office as Second Class Mail Matter, March 12, 1892.

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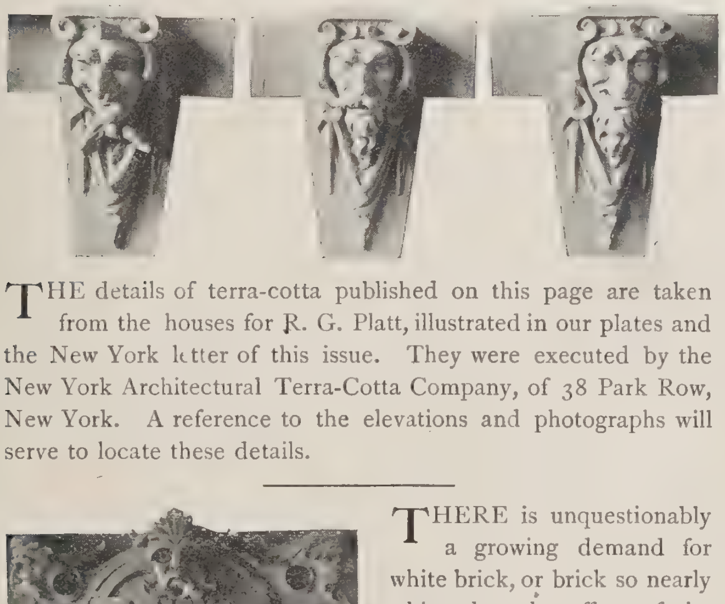
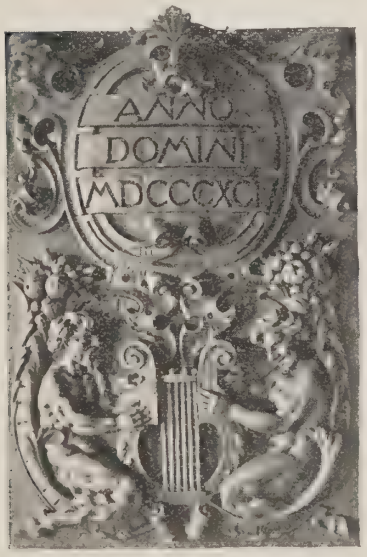


THE details of terra-cotta published on this page are taken from the houses for R. G. Platt, illustrated in our plates and the New York letter of this issue. They were executed by the New York Architectural Terra-Cotta Company, of 38 Park Row, New York. A reference to the elevations and photographs will serve to locate these details.



THERE is unquestionably a growing demand for white brick, or brick so nearly white that the effect of the finished building is white. The great difficulty experienced so far in the use of white brick is its tendency to turn green. This greening of bricks, however delightful may be its effect in some instances, is seldom desirable on work for which a white brick would be used. Many manufacturers have taken a hand in producing white brick, and gradually they come nearer and nearer the mark. Two of the latest ventures in this white brick field have so far been quite successful, and the tests the brick have been submitted to warrant editorial mention. The Eastern Hydraulic-Press Brick Company have put out a very handsome white brick which Mr. Mack has been abusing for several months to the best of his ability. He has frozen and boiled it, time after time, subjected it to all varieties of weather, and it is still white. This he has done before placing the brick upon the market, to satisfy himself as far as possible that he had a good white brick. While this brick has not been out long enough to have the actual test of building, there is a fair probability of its satisfactorily standing such a test. The other brick referred to is made by the Powhattan Clay Manufacturing Company, near Richmond, Va. It is being used by Carrère & Hastings in the large Jefferson Hotel in that city, and so far shows no signs of greening. If there are instances of other white brick being successfully made, we would like to have them brought to our attention, as it is a matter in which architects are taking increased interest.

WE have had an inquiry from a subscriber, which is published in the manufacturers' department of this issue, and which brings up a subject upon which we want the opinion of our architectural readers. The correspondent inquires whether common brick are ever made Roman shape, and if so, with what success. We do not know of a single instance, yet we cannot see any reason why such a shape in good quality common brick should not become immediately popular with architects. Our purpose in repeating the question here is to call for expressions of opinion from architects. If The Brickbuilder can be useful in any special way, it is in placing the consumer's wants before the producer. If architects want and will use a good quality common brick in Roman shape, let them write us, giving us such requirements as will guide the manufacturer in satisfactorily supplying this want. If there are any manufacturers making such brick, we would like to know where there are. Undoubtedly

the brick machinery manufacturers can inform us whether they have fitted any of their machines for producing common brick in Roman shape, and we would like light on the subject from them.

SUCCESS should attend the efforts of the manufacturer who enlists the ablest kind of professional service in the preparation of his stock designs. We cannot too highly commend such a course, and we feel fully justified in calling our readers' attention to the work Mr. J. A. Schweinfurth has been doing for Messrs. Fiske, Homes & Co. of Boston. Mr. Schweinfurth has designed a number of brick and terra-cotta mantels, which can be furnished glazed, if desired, but which are primarily intended to be made in quiet, almost neutral tones of dull-finish terra-cotta. This work is characterized by the finest modelling, rendering the mantels as suitable for interior finish as cut stone would be. The designs are made with a view to varying width in chimney-breasts, and are adjustable to such differences within certain limits. Many of them are illustrated by perspective drawings by Mr. Schweinfurth, similar to the plate on page 120 of this issue, and are reproduced in the new catalogue Fiske, Homes & Co. are now issuing. The mantels run in price all the way from $30 to $150, and scale diagrams for setting them are supplied so that they can be put in place by any skilful mason or tile setter. In securing the services of Mr. Schweinfurth, this firm made their longest step towards success, as without good designs the finest terra-cotta work is valueless.

THE attention of non-subscribers is especially called to the supplementary half-tone illustrations we begin publishing this issue with "Brick and Marble of the Middle Ages." These large plates, being full-size reproductions of the finest foreign photographs, could not be bought for the cost of the paper, let alone the cabinet size photographic reproductions which are also supplementary to this article. Clubs of draughtsmen are especially solicited. Our discounts for such clubs are very liberal.

BRICKBUILDER COMPETITION FOR A CITY HOUSE.

AWARD.

FIRST PRIZE, $100.
 "Jerry." Louis Sonntag, Philadelphia.
SECOND PRIZE, $50.
 Lion Rampant. James C. Green, St. Louis, Mo.
THIRD PRIZE, $25.
 Cross in Circle. E. S. Wester, Boston, Mass.
FOURTH PRIZE. Book worth $15.
 "Capital." Gilbert F. Crump, Rochester, N. Y.
FIFTH PRIZE. Book worth $10.
 Wreath and Torch. Edwin R. Clark, Lowell, Mass.
SIXTH PRIZE. Book worth $5.
 Brick and Terra-Cotta. J. Mills Platt, Rochester, N. Y.
SPECIAL MENTION.
 "Hasty Pudding." Harvey T. Hauer, Philadelphia.
 "Roccoco." Edward J. Willingale, New York.
 "Civility." Herbert G. Paul, Toronto, Canada.
 Double Cross. Charles R. Ten Eyck, Bayonne, N. J.

There were twenty-six designs sent in, the average of which, both in design and draughtsmanship, was very high. Mr. George H. Wetherell, of Winslow & Wetherell, and Messrs. Robert D. Andrews and Herbert Jaques, of Andrews, Jaques & Rantoul, acted as the jury of award. Their report, with some of the prize designs, will appear in the July number. The problem was one of the most difficult that could have been given out, and the number of creditable solutions received was a matter of surprise.

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FIREPROOFING.

THE INSURANCE OF PUBLIC BUILDINGS.

WITHIN the last quarter of a century a change has been gradually taking place in the minds of American fire underwriters respecting the advantages of fireproof construction in buildings, and the responsibility that can be fairly thrown upon them to do what they can in thus improving the character of our building property. Before the time of the great fires in Chicago and Boston, the underwriters who were the recognized leaders in the fire insurance business were inclined to take the position that it was no concern of theirs to urge the advantages of fire-resisting construction; they were in business to insure against loss by fire, and to entreat the public to so put up their buildings that there would be little or no loss, was, in effect, for the insurance men to undermine their source of livelihood, by making insurance unnecessary. Insurance against fire was a species of speculation, and the greater the risk the larger would be the commissions of the "middle men," — the underwriters who collected the premiums from the general public to pay the losses of that section of the public who were unfortunate.

This method of regarding the question was seriously disturbed by the great conflagrations just referred to. These proved that faulty construction in a large city might easily lead to results which would bankrupt the insuring companies; and the ashes of the two great fires were hardly cold before the underwriters began to formulate methods of rating which would accord to those who were willing to put up a better class of building a decided discrimination in their rates of insurance.

But two decades ago the idea that mercantile, manufacturing, storage, or even office buildings would be put up in a thoroughly fire-resisting manner was hardly entertained. The schedules for rating buildings prepared by the Boston and New York Boards of Fire Underwriters were based upon the theory that it was impossible to expect the American property owner to build in this manner. The United States government might construct fireproof buildings, and some of the great life insurance companies might put up office structures of this character, but there the effort would end. The rating schedules issued from 1872 to 1880 were intended to classify and rate buildings which have been described as frame structures, surrounded on all four sides by brick, stone, and sometimes by iron walls. No effort was made to provide by rates of insurance for anything better than this, and it was even at that time held that it was hardly wise to encourage such construction, since the owner of such a building, or its occupants, would not consider that it was necessary to protect themselves from loss by insurance. Certain truths had at that time had their significance forced home upon the underwriters. One was that wooden mansard roofs were productive causes of an extension of a fire; another was that when exposed to great heat an eight-inch, or even a twelve-inch brick wall was an insufficient barrier; but that even a thin brick wall might be safer, under such conditions, than one built of granite. But these were all conflagration lessons, that had little bearing on the question of interior construction, which was not much better in our large cities from 1873 to 1880 than it had been from 1860 to 1873. In fact, up to twelve or fourteen years ago we had in all of our American cities buildings put up which for the combustible character of their interiors were as bad as any that had ever been built since the days of the Revolution; and these with the tacit approval of the fire underwriters.

In the interval referred to a decided change for the better has taken place. This was partly brought about by the success met with by the "mill mutual" insurance companies, in what is known as mill constructed buildings, a method which was about ten years ago first introduced into the construction of the modern city warehouse. From the theory of having each floor cut off completely from other floors, it is only a step to the demand that the interior division walls, the floors themselves, and, in fact, all of the interior except the inner finish, shall be made of incombustible materials. The growth toward this demand has been slow, but it has been progressive and hence healthy. The underwriters have not been far in advance of public opinion — not so far, possibly, as they should have been; but they have been in advance, and are now doing all that they can to induce, by the advantages they offer in the way of rates of insurance premium, the owners of real estate to put up fireproof buildings, and the manufacturers and merchants to occupy these.

The practical question is, What are these inducements, and are they sufficient to lead to the construction of the fireproof type of building? I can answer this only by stating what they are and leaving it for those interested as owners and occupants of buildings to decide whether or not they are sufficient.

In the first place, it is well to point out that there was never a time in the commercial history of this country when it was so difficult for those owning property or doing business in the centres of our large cities to obtain the insurance protection which they require for safety, and for the maintenance of their business credit as merchants. The number of fires in our large cities tends constantly to increase, which causes the managers of insurance companies, looking back on the numerous corporate wrecks of the past, to cut down their lines (that is, the amount that they will insure on any one risk) to exceedingly small dimensions. Now this comes at a time when the requirements of business compel dealers to carry large stocks of goods, and to occupy large stores. The result is that many of our merchants are running risks in the way of possible loss by fire which they do not like to think of, but which make them seriously alarmed when any fire occurs in the vicinity of their stores. Others of their number are ransacking the world for insurance protection, and failing to find enough of this in China, Australia, and elsewhere, are trusting to the questionable guarantees of Lloyd and mutual associations which have been recently started in this country. Now, if these merchants occupied buildings which were recognized as distinctly fireproof,— that is, buildings in which wood and other combustible substances were only used for mere purposes of finish,— there is little doubt that companies which limit their lines to say $10,000 on a risk will quickly increase it to $25,000 or $30,000. In a word, the possibilities of obtaining insurance would be increased from one hundred to two hundred per cent. To the owner of a building this would sometimes mean the difference between having a tenant and not having one. The same foreign companies which limit their lines to say $10,000 on a large departmental store in an American city, will write the equivalent of $100,000 on the Louvre or Bon Marché in Paris, because they know that these two establishments are carried on in strictly fireproof buildings.

And then comes the matter of rate of premium. If I am not mistaken, the rate on the Bon Marché, in Paris, has varied in recent years from one quarter to three eighths of one per cent per annum, or about one fifth of the rate paid for insurance by such establishments as Jordan, Marsh & Co. in Boston, Macey & Co. in New York, or Wanamaker & Co. in Philadelphia. In other words, for $1,000,000 insurance, the proprietors of the Bon Marché would pay about $2,500, while the similar American establishments would pay for the same volume of insurance protection from $12,500 to $15,000. The difference in this case is chiefly in the matter of building construction. The conditions of the business are substantially alike, while the fire department of Paris can hardly be said to equal in efficiency those of our large American cities. In the opinion of the fire underwriters who insure both the Paris risks and similar risks here, there is a difference in safety in favor of the former equal to the interest that would be earned on several hundreds of thousands of dollars, or more than enough to pay for the difference in building fireproof buildings for these great American stores.

Take a comparison in building in this country. By the schedules for rating, adopted by the underwriters, a strictly fireproof building rates, on the average, at not more than half the rate asked for insuring the best building of ordinary construction, and this holds much the same with the contents of these. We are prepared in the Boston Board of Fire Underwriters to give approximate rates upon building plans, when the future occupancy can be definitely determined.

A number of plans have been recently worked out; it has been found that the saving in the cost of insurance was more than sufficient to pay a fair rate of interest on the increased cost of fireproof construction over ordinary construction.

The underwriters now realize that, if their business is ever to be brought up to a scientific basis, it must be by preventing conflagrations, which are, to their experiences, what a world wide plague would be to the actuary's tables of a life insurance company. Conflagrations can only be prevented by fireproof construction, and hence the insurance companies are now willing to grant for this class of work a far greater and fuller consideration than they have ever been before.

OSBORNE HOWES.

A FIREPROOF DOOR.

WE are in receipt of a description of a fireproof door invented by Mr. C. E. Richardson of Minneapolis, and manufactured by the Fireproof Door Company, 305 Boston Block, in that city. It consists of a door shape, pressed out of steel, into any desired size or pattern, and fitted over a simple wooden frame. The inside is filled with mineral wool, which the makers claim takes away all metal sound. The casings are covered the same as the door, the manufacturers furnishing both, as well as the necessary hardware. The metal can be finished in any one of the many processes of plating. They are claimed not to sag, swell, shrink, or warp, and are about one third lighter than hardwood doors, while their cost is about the same.

FIREPROOF BUILDINGS.

A WRITER in the New York *Recorder*, commenting on the destruction by fire of the Rev. Dr. Talmage's Tabernacle, in Brooklyn, adds: —

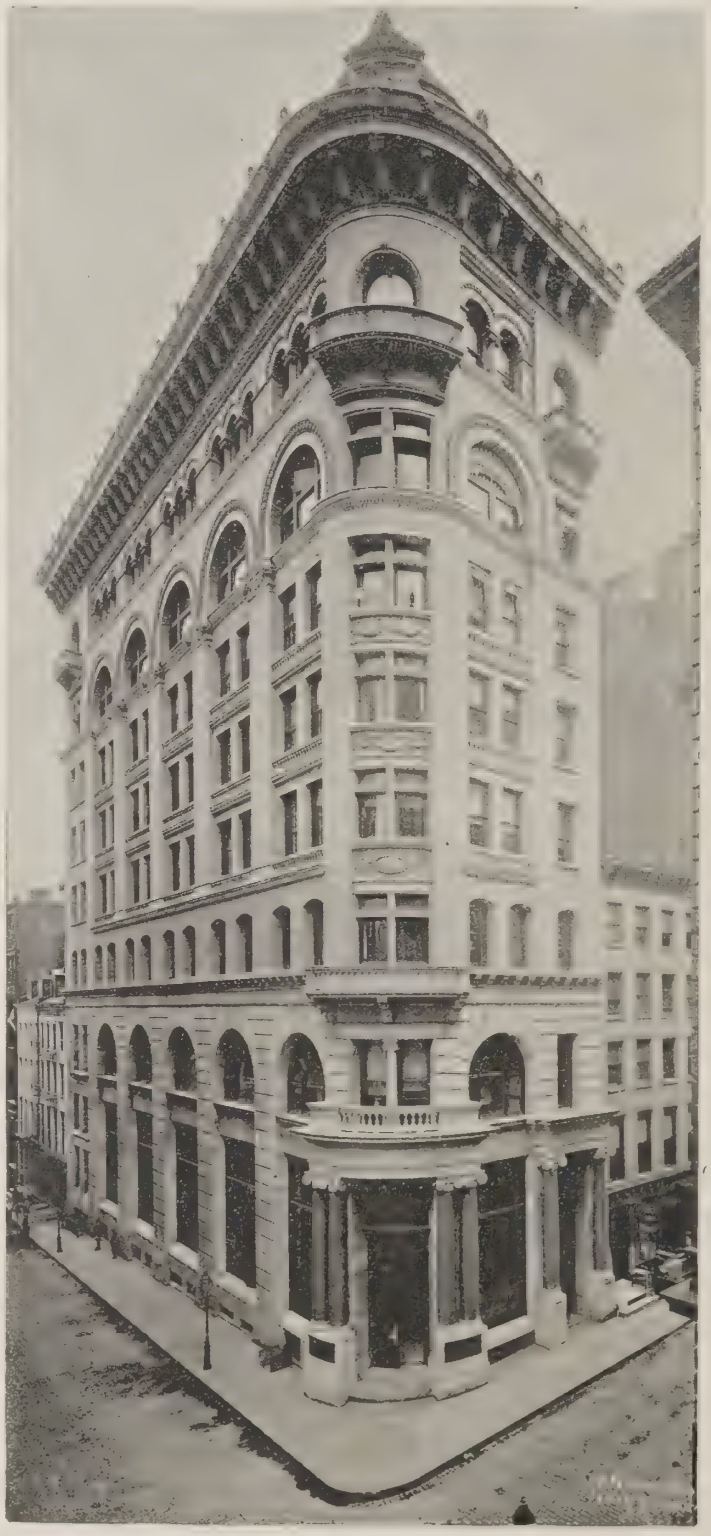
What is fireproof?

Iron isn't, because it melts in fierce heat, and in less heat expands. Thus an iron beam between two walls may expand so much as to throw one of them down. Stone isn't, because in fierce heat it crumbles away to dust. The material which is most nearly fireproof is good brick. The more it's baked, the harder it gets. So the best fireproof buildings have brick terra-cotta walls, floors of hollow brick, and doors and casings only of wood. Even then a fireproof building will burn if a very hot fire attacks it from the outside. But a fire starting in one of the rooms only burns up what's in that room and stops. It never gets very hot.

In such a fire as that in Chicago or Boston, the best of buildings would be damaged greatly, even if they did not fall.

Wood, when it is thin, burns very rapidly, but in big beams it doesn't catch fire so readily.

So in ordinary wooden buildings, it is the hollow spaces between the lath and the walls and floors that carry the fire out of sight like so many chimneys until it is ready to burst through. These hollow floors are one of the greatest dangers in fire. The stairway, with its wooden stairs, and the elevator shaft, if there is one, are the points of greatest danger, because they draw the fire up like chimneys.



THE Germania Building illustrated above is one of the important office buildings of New York City. It was designed by Messrs. Lamb & Rich of 265 Broadway, who have done some of the best business blocks in New York. The Lorillard Brick Works Company, of 92 Liberty Street, New York, furnished the hollow fireproofing material used to render this structure absolutely fireproof.

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Mortar Stains.

These are in four standard colors, RED, BROWN, BLACK and BUFF, furnished either in pulp or dry. They are made from such pigments only as I have found best adapted for the purpose. They are strong and durable and can be relied upon in every case. They mix easily with Lime or Cement. Special colors made to order.

AND

Elastic Oil Cement.

This is made expressly for laying or embedding Slate and Tile Roofs, repairing leaks around Chimneys, Dormer Windows, Skylights, Scuttles and Fire Walls; it is waterproof and will not crack. Made in three colors, Red, Brown and Black.

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LIMES AND CEMENTS,
MORTARS AND MORTAR COLORS.

MACHINE-MADE LIME MORTAR FOR BRICKLAYING AND PLASTERING.

CONSIDERING the great number of improvements that have been made in recent years, in manufacturing and supplying the various materials entering into the construction of buildings, improving the quality of the same, reducing the cost and greatly facilitating the completion of the buildings, it is a very remarkable fact that no improvement has been made, until recently, in the method of making lime mortar, one of the most important materials entering into the construction of buildings. It is still universally made in the most crude, inconvenient, and unreliable manner,—made with a hoe by hand on the streets.

The manufacture of lime mortar, for both bricklaying and plastering, by machinery, and its delivery at the building in cart loads in a *wet* and *plastic* condition, with the goat hair, or any of the various fibres, and fresh water incorporated with the lime and sand, ready for use, without the addition of any other material or further manipulation whatever, excepting occasionally a little water for retempering, as now done in New York City, Brooklyn, and Jersey City by the United States Mortar Supply Company of No. 289 4th Avenue, New York City, is one of the marked improvement that have been made in connection with building operations in recent years.

Realizing the necessity of a more convenient, reliable, satisfactory, and economical plastering material than could be obtained in the New York market, a number of the most prominent building contractors and plasterers of New York City and Brooklyn formed the above company to supply the building trade of that section with machine-made lime mortar as the best, most convenient, economical, and healthful plastering material, and the best and cheapest lime mortar for bricklaying. The idea of manufacturing lime mortar by machinery and its delivery at the building, ready for use, was introduced in New York City by Mr. W. W. Kenly, member of the American Society of Civil Engineers, the present general manager of the company. The works of the company were, also, designed and erected by him. Since its introduction in New York City, in September, 1893, it has been used for plastering nearly all the important and costly buildings recently completed, all noted examples of the very best modern practice, both in construction and the materials used, such as the Manhattan Life Insurance Company's Building, 68 and 70 Broadway; the Home Life Insurance Company's Building, Broadway, near Murray Street; the Bowery Savings Bank, Corn Exchange Bank, "Life" Building, and many others, and it has also been adopted for plastering the new St. Luke's Hospital. After a thorough trial it has been specified by many of the leading architects for a large number of important and costly buildings recently let to contract, and for many others for which plans are now in preparation. Machine-made lime mortar is not a new "patent plaster," but the old, well-known, and thoroughly tested lime mortar, made by machinery by practical and experienced men, in a scientific and systematic method, instead of the present crude, inconvenient, and unreliable manner by hand with a hoe. It *positively* contains no material not used in lime mortar made by hand.

The value and merits of good lime mortar as a plastering material have been proven and established by its successful and continued use for centuries. It is the *only* plastering material whose value and merits have been established by the test of long experience. It is the most healthful of all plastering materials and is thus a most valuable sanitary agent; lime being most commonly and generally used as a disinfectant and purifier of unhealthful places, and when used as a plastering material it is an ever-present, silent but active sanitary agent, continually giving forth its health-preserving properties. This especial and valuable property possessed by lime mortar only is recognized and endorsed by architects, the medical profession, and sanitary engineers. It is worthy of note that the Post-Graduate Hospital, Seton Hospital, New York Hospital, House of Relief, and the Eye and Ear Infirmary, all recently completed in New York City, were plastered with machine-made lime mortar, and it has been adopted for plastering the new St. Luke's Hospital.

Although lime mortar possesses so many valuable properties as a plastering material, there are many and serious objections to its use as made by hand. It is inconvenient, more or less unreliable in quality, taking up more room around the building than all the other building operations combined, costs more when made in the cellars, thereby delaying the completion of the building. The hair, being generally put into the lime paste when it is hot, is burned out, causing the ceilings to fall, and, being very frequently used in a short time after it is made, it "pops" or "blisters," damaging the decorations and causing great subsequent annoyance and expense. All the objections that have been made in recent years against the use of lime mortar have been based on the argument: Not that good lime mortar is not a good and satisfactory plastering material, but that it is only *half made* by hand. The value and merits of good lime mortar are too well known and

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MANUFACTURERS OF
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ROSENDALE HYDRAULIC **CEMENT.** Warranted Superior to any Manufactured.
STRONGEST, DARKEST, BEST, ALWAYS FRESH.
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established to need any special or further arguments in its favor in this article, and machine-made lime mortar, whilst possessing all the valuable properties of hand-made lime mortar as a bricklaying and plastering material, removes all the objections to the use of lime mortar as made by hand, and possesses many additional advantages, especially as a plastering material.

One of the especial and valuable advantages of machine-made lime mortar is that its use advances the completion of large and costly buildings in the crowded sections of large cities, as proven by its use in plastering the Corn Exchange Bank, corner of Beaver and Williams Streets, New York City; the completion of this building having been advanced from four to five weeks owing to the cellar space not being necessarily occupied in making and storing the mortar, which would have delayed the plumbing installation of the steam and electric plants, etc. This advantage was also proven by its use for plastering the Home Life Insurance Company's Building, where machine-made lime mortar was substituted for a well-known "patent plaster," because of its superior qualities, greater economy, and from the valuable fact that this important and costly building could be completed in less time by the use of machine-made mortar.

The Manhattan Life Insurance Company's Building, New York City, is also a well-established example of its advantages in advancing the completion of costly buildings, thus saving additional interest on the cost of the building, and giving earlier occupancy and consequently earlier revenue from rentals. Some of the additional advantages of machine-made lime mortar may be especially mentioned as follows: —

1. It is guaranteed not to "pop" or "blister," one of the serious objections to hand-made mortar.

2. It will not stain or discolor the walls and decorations, nor rust or corrode metallic substances, as various other plastering materials do, as it is a well-established fact that lime preserves metallic substances

3. The above advantages, combined with its uniform color, adapts it especially for use in plastering churches, public halls, theatres, etc., where decorations are applied on the rough finish.

4. It saves extra expense when mortar has to be made in the cellars of buildings.

5. It saves space around the building, giving more room for the other building operations.

6. Being always correctly proportioned and thoroughly mixed, it is more uniform in quality, of greater adhesive strength, making a harder wall; and its smoothness enables it to be applied more rapidly.

7. Being delivered on order, ready for use, it is especially convenient and economical for *alteration* and *repair* work.

8. Its use is an assurance to owners and architects that requirements of their specifications are complied with, and relieves them of any anxiety and apprehension on account of the use of half-made and inferior mortar.

9. It is better, cheaper, more convenient and economical than hand-made mortar, or patent plasters, and its many superior qualities and advantages make it the perfection of plastering material.

Its advantages as a bricklaying mortar are owing to its freedom from coarse gravel and lumps of unslaked lime, so common in the hand-made mortar, saving waste, both of mortar and time, caused by removing same from under the bricks when set; and its smoothness enables the bricklayer and mason to perform his work with more

MILWAUKEE MORTAR COLORS
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RED BRICK BRAND
RICKETSON MINERAL PAINT WORKS
MILWAUKEE, WIS.

RED ⁘ BLACK
SPECIAL SHADES MADE TO ORDER
BROWN ⁘ BUFF
Easy to Work. - - Will Not Fade.

Alsen's Portland Cement.

The strongest, finest ground, and most uniform Cement in the world. Permits the admixture of more sand than any other, and is the best for mortar or stuccoing.

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All Colors Permanent and Superior to any Article in Use.

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Painters' and Builders' Supplies,

ESTABLISHED 1844. PHILADELPHIA, PA.

SEND FOR CIRCULAR AND CATALOGUE.

ease, comfort, and dispatch; and its greater adhesiveness, due to the thorough mixing, makes a stronger bond. Owing to its uniform quality and smoothness, cement can be more thoroughly and easily mixed with it than with the hand-made mortar.

All practical men connected with building operations will readily appreciate these many advantages of machine-made lime mortar, and its general use in all large cities is merely a matter of a few years, as practical business men will quickly avail themselves of so great an improvement over the present method.

CEMENT IN CONCRETE CONSTRUCTION.

THERE is a growing consumption of the best brands of cement in improved concrete construction, which has been used in California with great success, starting, we believe, from the office of Percy & Hamilton, architects of San Francisco, who have applied the Ransome system to several large and important structures. This form of construction has spread eastward by the organization of companies to apply it in several large cities.

The Aberthaw Construction Company, Boston, tell us that they are meeting with great success in this concrete construction. It is a method of erecting ordinary buildings with concrete as a substitute for more expensive material. The advantages of concrete for foundations, and all masonry work under water, or under ground, are recognized by every one; also its adaptability for basement floors, sidewalks, and other positions where surface wear and compression are the principal forces to be resisted. For walls and partitions floors, roofs of buildings, its adaptability has not been so apparent, or its application as successful as might be desired. On account of the small and very uncertain tensile strength of ordinary concrete, it has appeared to be entirely unadapted for horizontal beams or floors, or any parts of a structure subject to other than a compressive force. Many attempts have been made in the past to unite the tensile strength of iron with the compressive strength of concrete in such a manner as to secure full value for each material for its respective position. The methods were more or less complicated, and from a question of relative cost not feasible, there being great waste of the more expensive material. Mr. E. L. Ransome, however, working on this idea of combination, invented and applied plain, square, cold-twisted iron bars for this work, and the result demonstrated the practicability of the

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UNEXCELLED IN QUALITY.

"The results of tests with standard quartz are far above the average of most cements."
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Inspector of Asphalt and Cements,
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"This brand of Portland Cement was found especially qualified for the purpose of concrete casting on account of its perfect uniformity, intensive fineness, progressive induration after the first setting, and of its great tensile and crushing strength."
Vide Report of CARL A. TRIK,
Superintendent of Bridges, Philadelphia,
On Concrete Arch Highway Bridge over Pennypack Creek.

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The Alpha Portland Cement.

Its superiority is fully established; for fineness, uniformity of color, and great tensile strength it is unexcelled. Every barrel of "ALPHA PORTLAND CEMENT" guaranteed equal to the very best brands of "German Portland Cements," and its minimum tensile strength guaranteed as follows:

Sole New England Agents,
JAMES A. DAVIS & CO.,
No. 92 State St., Boston.

Gen'l Agents,
WM. J. DONALDSON & CO.,
Betz Bldg., Phila.

GUARANTEE.

1 day in air, 6 days in water,	400 lbs.	Neat test Per square inch.
1 " " " 27 " " "	500 "	
1 " " " 3 months in water	600 "	

3 parts of sand to 1 of cement.— Adhesive test.

1 day in air, 6 days in water,	125 lbs.	Per square inch.
1 " " " 27 " " "	175 "	

FINENESS.

Residue on sieve No. 50,	None.
" " " " 100,	10 per cent.
Passing through sieve No 200,	65 "

Every barrel guaranteed to stand the boiling test, the test for safety.

DYCKERHOFF PORTLAND CEMENT

Is superior to any other Portland Cement made. It is very finely ground, always uniform and reliable, and of such extraordinary strength, that it will permit the addition of 25 per cent more sand, etc., than other well-known Portland Cements, and produce the most durable work. It is unalterable in volume and not liable to crack.

8,000 barrels have been used in the foundations of the Bartholdi Statue of Liberty, and it has also been used in the construction of the Washington Monument at Washington.

Pamphlet with directions for its employment, testimonials and tests, sent on application.

HAM & CARTER,
560 ALBANY STREET, BOSTON.

E. THIELE,
78 WILLIAM STREET, NEW YORK,
Sole Agent United States.

ESTABLISHED 1858.

WILLIAM N. BEACH, President.

LAWRENCEVILLE CEMENT CO.,

MANUFACTURERS OF

BEACH'S ROSENDALE HYDRAULIC CEMENT.

Guaranteed to stand all required tests.

115 Broadway, NEW YORK.

idea, it showing by test that the combination had a much greater advantage than the original tensile strength of iron. Hundreds of tests have since been made by various experts, with the uniform result that the cold twisting of plain iron bars increased their tensile strength from ten to twenty per cent.

Some of the buildings which have been erected by this method are the California Academy of Science, the Leland Stanford, Jr., Museum, Torpedo Station on Goat Island, Borax Works, Alameda.

The Aberthaw Construction Company publish a very interesting catalogue, giving detail of construction, which is well worth reading, and which they will be pleased to send to any address.

THE BOILING TEST FOR CEMENTS.

THE stress laid by some manufacturers of cement upon the importance of the boiling test has led others to deny the usefulness of this test. From the opinions cited by the parties on both sides, there is evidently a difference of opinion among engineers and architects. As every test is important which is of real value in determining the character of cement, we have called upon a number of acknowledged authorities for their opinion as to just what the boiling test demonstrates, and how it should be conducted. As it is impossible to make a special request upon everybody who is in a position to contribute information on this subject, we herewith invite architects and engineers, who have given the matter consideration, to add their remarks, that we may thereby gain a consensus of opinion.

MORTAR COLORS FOR WHITE BRICK.

SOME of the very best effects we have seen in the laying of white brick are secured by a use of a gray mortar color, producing a mortar slightly darker than the brick. If the effect is too cold, however, a mortar colored light buff will do wonders in warming the surface. Care should be taken not to get too strong a buff, as it will materially change the effect, to secure which the white brick were used.

ARCHITECTS AND CEMENT SPECIFICATIONS.

IN all good brickwork, especially exteriors, the best kind of cement mortar should always be used. Judging from the report of various manufacturers, architects are apt to be very slack in the matter, not only of specifying but of testing the cement to be used. Every precaution is necessary in the erection of a modern fireproof building with all its hollow tile work to be set around the steel frame. When certain manufacturers have labored conscientiously to produce a cement of the very best quality, and architects are convinced of this, it seems not only unjust to the manufacturer but stupid in the architect to draw cement specifications so loose that the contractor can, as he usually does, run in a cheaper and weaker brand.

ATLAS PORTLAND CEMENT.

WARRANTED EQUAL TO ANY AND SUPERIOR TO MOST OF THE FOREIGN BRANDS.

OFFICIAL TESTS, Nos. 3567 and 3568, made by the DEPARTMENT OF DOCKS, New York, March 31, 1894, being part of contract No. 464 for 8,000 barrels.
TENSILE STRENGTH, 7 days, neat cement . . . . 622 lbs.
" " 7 days, 2 parts sand to 1 of cement . . . . 332 lbs.
Pats steamed and boiled . . . . Satisfactory.

All our product is of the first quality, and is the only American Portland Cement that meets the requirements of the U. S. Government and the New York Department of Docks. We make no second grade or so-called improved cement.

ATLAS CEMENT COMPANY, 143 LIBERTY STREET, NEW YORK CITY.

Holy Trinity Parish House,

PHILADELPHIA.

◆◆

Buff and Pompeian Brick Laid in Clinton Hematite Red.

◆◆

Messrs. Hewitt & Bro., Architects,
PHILADELPHIA.

◆◆

Messrs. Dorsey & Smith, Builders,
PHILADELPHIA.

◆◆

. . ILLUSTRATION FROM . .
"A Little Talk on Metallic Paints and Mortar Colors."

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CLINTON METALLIC PAINT CO.,
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High Grade Mortar Colors and Metallic Paints.

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FISKE, HOMES & CO., 164 Devonshire Street, - - - - - BOSTON.

THE MANUFACTURER.

A Department devoted to the Market Side of Clay Production.

BRICK, AND THE COMING MODEL CITY.

SERIATELY TREATED AND CONSIDERED.

By J. W. Crary, Sr.

I WILL take the risk of being called visionary when I say that the twentieth century will not close without seeing most of our cities with streets 180 feet wide. There will be 10 feet on each side for sidewalks; that will leave 160 feet for streets and park. The centre will be a park 60 feet wide. This will be divided into three equal parts; the centre will be paved in "mosaic." On either side there will be a park, with a suitable row of trees in the centre of it. These parks will be protected by a substantial iron fence, set in terra-cotta. The promenade between the parks will have proper, convenient gates. The side streets will be paved with brick, and the sidewalks will be paved with tile, of suitable color and make.

A terra-cotta sewer pipe of sufficient size will be laid in the streets, so that the drainage will be perfect from streets and back-yards. At suitable elevated points along the streets there will be smokestacks, that will be kept heated by proper means, and will be connected with the sewers in the streets.

The smokestacks will draw up and destroy all the poisonous gases that are generated in the sewers. All garbage, or filth in streets, will be carefully removed every day, and by the best means disinfected. Privies will be so constructed that, instead of passing excremental matter into sewers, it will be carried out every week to some proper place, and there disinfected, and manufactured into valuable fertilizer.

WATER SUPPLY FOR COOKING AND DRINKING IN BRICK CISTERNS.

On every lot that is improved by buildings, dwellings, or otherwise, there will be cisterns, built of brick and cement.

In cities where there is much frost, the cisterns will be built underground. In cities where there is little frost, cisterns may be built on the surface. When built underground, they will be "egg-shaped," vertical section. It will be seen that the underground cistern can be built anywhere where the excavation can be done. It can be built of brick, four-inch wall, if the diameter is not over ten feet. Over that, the wall should be two brick (wide) thick. The brick should be hard, well burned, and perfectly wet when laid. The mortar should be composed of best hydraulic cement and sharp, clean sand, in proportions to "*set*" *hard*, and all the joints should be perfectly "*flushed*" with the mortar. To cement the inside, cement and clean sand of equal proportions should be used. The workman should commence at the top; he should wet the brick before putting on cement, and the cement should be put on at least a quarter inch thick, and after it sets a little it should be brushed with thick *wash* of pure cement. In building an underground cistern, great care should be taken to thoroughly pack the earth all round the outside of wall. The crown arch may be built without a "*centre*." A real true expert bricklayer can start the *crown* from the "*skewback*," and when it is above ground he can get out and stand on the arch as he lays the brick. One course is laid all round, and when closed by the "key brick" it cannot fall. The reason of it is plain to the scientific eye. I have thus crowned over a cistern sixteen feet in diameter, standing and working on top.

MY FIRST EXPERIMENTS IN BUILDING SURFACE CISTERNS

were in New Orleans. It is quite difficult to find ground in New Orleans where a cistern can be built to any proper depth, and when a large cistern is needed it must be built above ground; so that few brick cisterns were built, the wooden "tank" being in general use. Brick cisterns built round, and on the surface, had been failures, and I started the building of concave outside cisterns. They were a noted success. I built them ten to fourteen feet high; and some that held one thousand barrels of water. If built right, they are cheap and ornamental. It is a fact not generally known that the larger portion of cooking and drinking water in Louisiana and the southern part of Mississippi is rain water caught in cisterns; most of them are brick, where the ground is suitable, and brick can be had. One large cistern is built which is filled during the winter rains; then one or more other cisterns are built that are supplied by rains of all seasons. The one filled by winter rains is cut off from rain water, only in the winter season; so that the water becomes perfectly pure and tasteless. So it would be best everywhere to have at least two good brick cisterns. There is scarcely a place in the United States where the rainfall is not sufficient to supply the inhabitants, if it were properly caught and carefully used.

THE BUILDING OF HOUSES IN THE FUTURE MODEL CITY.

As I have said in previous writing, health, morals, and social advancement, to a high and respectable position, require that each family shall live in separate houses. No family should have less than a *four-roomed house*. These houses will be built in pairs, two stories high, or in solid rows, with a solid dividing "party wall," along which there will be a "hallway" from front to back yard. A narrow stairway will lead from the hall to second story. There will be two rooms and a small kitchen back, on first floor, and two rooms on second floor. A six-roomed house may be built on this plan, by having a one-story back building; or an eight or nine roomed house may be built on the same plan carried three stories high, or a ten or twelve roomed house four stories high. The roof will be covered with tile, and a skylight made to light the hall, and give easy access to the roof. In cold-winter climates there will be a cellar in each house. All these constructions will not differ much from the common plan of building now in the city of Philadelphia. The distinctive difference will be in building better and stronger brick walls; in covering the roofs with tile; in making door and window frames and casings of terra-cotta; in making all outside door and window shutters of fireproof material, and the same for floors, "washboards," etc., so that all buildings will be absolutely fireproof.

BRICKS AND TERRA-COTTA WILL BE USED WHEREVER PRACTICABLE.

Stone, even for cellars, is not so good or reliable as brick. The common way of building cellar walls with rough, unshapen stone, only partly headed in mortar, and often without "bond," affords no security for the brick walls built upon them. Hard, strong brick are much cheaper and better than stone, for all building purposes. A perfect "bond" can always be made with brick, but unless stone is cut, and properly shaped to make a "bond," it is impracticable to make it; and if made by cut stone, it is too expensive, even for fronts. Bricks and terra-cotta are by far the best materials for all building purposes, and decidedly the cheapest and most durable. All brick walls that require lateral strength should have pilasters; this saves brick: and a thirteen-inch wall, with a pilaster every eight feet, projecting four inches, with eight and a half inch face, is as strong laterally as if it were an eighteen-inch solid wall. For all cellar walls, "party walls," fences, and windows and doors, brick and space can be saved by pilasters, with the addition of architectural symmetry and beauty.

IT WILL BE ASKED, WHEN WILL THESE IMPROVEMENTS BEGIN?

I will say that the changes I have suggested are already being discussed by civil engineers, architects, and sanitary authorities. Narrow streets and costly grounds have made a craze for high buildings and tenement houses. Architects have been called on to make the most of a small parcel of ground, and, instead of studying health conditions, they have taxed their brains to pile up all kinds of building material "sky-high," with a mixture of ornate finish. Our cities are full of these pestiferous ornaments, "tenement houses," and "flats," and the death rate is steadily increasing, while social evils are fearfully augmenting.

IT WILL NOT BE LONG BEFORE THE GENERAL PUBLIC WILL DEMAND A CHANGE.

Capitalists, architects, and brick and terra-cotta manufacturers, will see their great opportunity to inaugurate the idea of building cities consistent with modern improvement and progress. They will either locate and place new cities, or extend and improve the suburbs of the old ones. A new field would thus be opened for capital, science, and skill, and soon the old cities would only be used for commercial purposes. This is a subject especially important to clay workers and architects. No stone, iron, or wood should be used for walls, except where absolutely necessary. Very light galvanized steel girders could be used instead of joists; they would be filled in between with light, hollow brick arches, and thus a building could be put up, floored, ceiled, and roofed with tile, that would be indestructible by fire; and the gain in insurance in five years would pay all the difference in cost above the common building. I will in my next paper say more on this point, and show a diagram of wall and girders of a house. All brickmakers are deeply interested in this subject, and they should help THE BRICKBUILDER to advocate and show the importance of brick building.

WASHINGTON MANUFACTURERS PROTEST.

THE character of Washington City, the capital of the United States, as far as its buildings are concerned, is essentially a brick-built city, and all the latest improvements in building operation are admirable illustrations of the possibilities in the brickmaking art, and stand for some of the best achievements in brick architecture. The white stone buildings, of which the city has a large number, have been looked upon as free from rivalry until the private residence of Mr. Leiter, on Dupont's Circle, began to take its complete form. It is of white brick, and is by all odds the most striking private residence in the city.

The extension of the fire limits about a year ago has had a decided tendency to encourage the brickmaking industry, for within the fire limits all buildings must be of fireproof materials, and brick, being the best all-round material, gets the advantage.

The greatest industry in the District of Columbia is brickmaking, and those engaged in this industry are thoroughly organized under the Brick Exchange. This organization has a membership of individuals, firms, and corporations representing several million dollars of capital employed in the manufacture of brick.

The members of the Brick Exchange have recently stepped into the field to fight legislation, and their antagonism to a bill now before Congress is somewhat significant. The bill over which the fight is taking place is one in which it is proposed to appropriate $4,350,000 to give Washington a perfect sewerage system. This bill is an outgrowth of a commission appointed by President Harrison in 1890. By this commission a report was sent to Congress in July, 1890, giving the above amount as an estimate for the proposed work, and provided that vitrified pipe would be used in all sewers of twenty-four inches in diameter, or less, properly laid in concrete; the larger sewers, the inverts to be made of concrete, brick, or stone, and the arches of brick.

The present protest from the Brick Exchange was brought out by the proposition of Capt. Derby, of the Engineering Department, in which he proposed to experiment relative to ascertaining if concrete could not be substituted for brick in the inverts and arches. The attitude of the brick manufacturers can be better explained in their own words. Mr. Holbrook, in an interview on the subject, said: —

"We do not object to the proposed issue of bonds for the construction of these sewers. What we most emphatically object to is experiments. This district has already suffered too much by experiments that have caused taxpayers hundreds of thousands of dollars. In the first place, our government is experimental. We are disfranchised. Then they built a water tunnel that was a failure, and tried experiments with block pavements. Decidedly we have had enough of experiments.

"That is our position, independent of our business as brick manufacturers. Now we, as the men who make bricks, know the history of the brick and its staying qualities. Is is a matter of history that bricks have stood the test of time. Concrete has not. Therefore it is to our interest to see that bricks are adhered to in this work.

"I am willing to admit that experiments are all right, but for a time, at least, we want to see them conducted at some one else's expense. That is the reason that we are combating the proposed trial of concrete, and strenuously urging that solid, substantial brick be used, material that is not a new venture, and which can be relied upon."

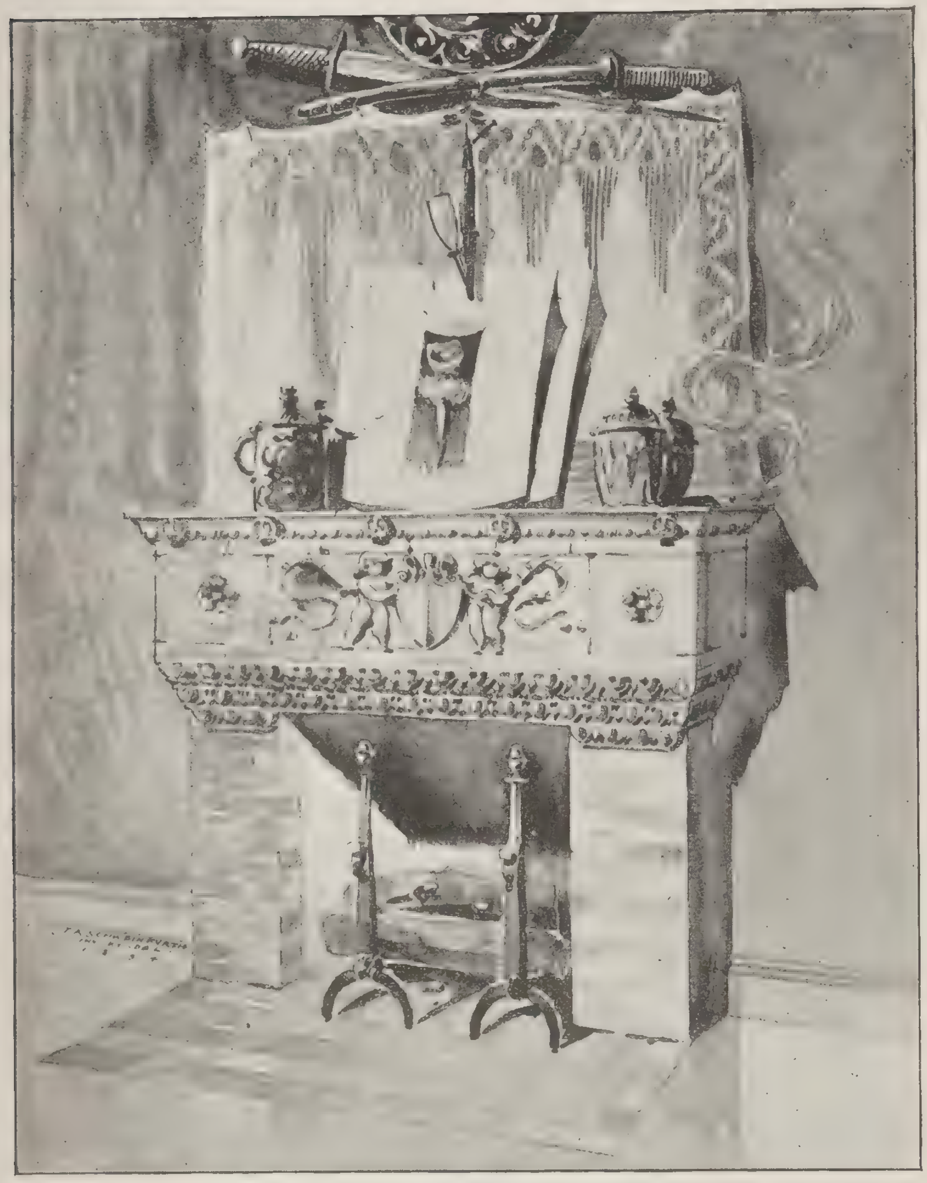
Mr. William H. West, president of the Exchange, stated that the Exchange was unanimous in declaring against any more experiments by the government engineers. He said: —

"The commissioners seem wedded to this process of experimentation as proposed by Capt. Derby. I can readily see how army officers are continually anxious to find some new plan for carrying out their plans as engineers. Many times they fail, and seldom they succeed. In case of failure they are removed to some other district until the taxpayers, who have stood the cost of their folly, have recovered from the breeze when the truth is known.

"I feel that it is going to be hard work to convince the commissioners of the truth of our claims, but when we go before the District Committee of the House, I think we can show them the utter folly of trying any further experiments, and prevent Capt. Derby and his co-engineers in their costly schemes."

Other members of the Exchange spoke in like manner, and the unanimous opinion of the brick manufacturers is that they will be able to defeat the plan of the District Commissioners.

The sentiment as expressed in the papers of the city is that if experiments are to be made the commissioners should have them done elsewhere, as the District has suffered too much from experiments, and there is no question that brick and stone are the most enduring materials for work of this character. Doubtful substitutes are not to be entertained.



BRICK AND TERRA-COTTA MANTEL.

DESIGNED BY J. A. SCHWEINFURTH, FOR FISKE, HOMES & CO., BOSTON.

THE MANUFACTURER AS AGENT.

IT occurs to us that the manufacturers, especially in the smaller cities, who make only common brick, could, without much trouble to themselves, act as agents for the manufacturers of fine ornamental brick and terra-cotta. It goes without saying that the clayworkers of this country owe it to themselves and to their brother-clayworkers to advance in every way possible the general use of clay materials. The established manufacturer of common building brick, who is likely to be an influential business man in the community, owes it to his trade to work for the introduction of brick pavements, even though he may never himself manufacture these. The satisfactory use of brick for paving benefits the whole clayworking fraternity, if only from the increased importance it gives to clayworking from the additional capital it brings into the trade. Likewise, but more directly, the manufacturer who furnishes brick for a building owes it to the manufacturers of terra-cotta to work for the use of this material for ornamental work in place of stone or the still worse material, sheet metal; he should use his influence to substitute tile for slate or other less durable roofing materials. It is a strong pull all together that we want, and the manufacturers of common brick, who are in the majority, can help themselves and their fellow-manufacturers, who have large sums invested in the production of more careful and costly lines of goods.

Let us illustrate by a specific example. On this page we publish a design for a brick and terra-cotta mantel. It is only one out of a large number made by this single firm, which is only one of several that are working on similar lines. The amount of capital represented in this small line of goods, before the first ounce of clay is taken from the bins for manufacturing, is larger than the average brickmaker's yearly profit. The services of an architect of the highest professional standing have been enlisted in the preparation of the designs, sketches, and actual working drawings. Such services are most expensive. To get these designs reproduced and made into catalogues is another large item of expense. All this is preparatory. Before such work is ready for the market and wholly satisfactory to the designer and the manufacturer, much experimental manufacturing must be done. When these mantels are at last ready their handsome appearance makes them a credit, not only to the firm making them, but to the present advanced state of the clayworking industry. Why should not other clayworkers strive to have them adopted in place of wood or slate mantels? The manufacturers would undoubtedly allow a commission on all orders sent them by the trade, and every manufacturer could well afford to have a sample mantel erected in his office, from which to secure orders. But the argument does not apply alone to those particular mantels. It applies to all terra-cotta and glazed brick work, all roofing, flooring, and wall tiles. In the pages of THE BRICKBUILDER manufacturers will constantly find photographs of terra-cotta details of the best type from the best manufacturers. These will often be suggestive of details applicable to work you are supplying brick for, and, by properly bringing them to the attention of the architect, correspondence may be started which will lead to the use of terra-cotta. There are few instances where the terra-cotta company would not make it an object for you to continue such work. It benefits you every time you secure such a use of clay materials, not only by the amount of your commission, but by the extra boost you give clayworking in general.

WHO MAKES ROMAN-SHAPE COMMON BRICK?

AN INQUIRY FOR MANUFACTURERS TO ANSWER.

THE EDITOR OF THE BRICKBUILDER.

Sir, — I write to inquire if common stock brick have been made Roman shape, $1\frac{1}{2} \times 4 \times 12$ inches, and with what success. I think it would make a very desirable brick. Allow me to say I am well pleased with THE BRICKBUILDER.

Respectfully,
FRED W. WEITZ,
Contractor.

Des Moines, Ia.

[We do not know of any manufacturer of common brick making this shape. As it is something for which we think there would be a large market, and as architects would undoubtedly avail themselves of it, for use as a front brick where rough texture is desired, we will take pleasure in publishing a list of manufacturers who can supply such brick. We respectfully solicit correspondence relating to this subject from both manufacturers and consumers.— EDITOR.]

Yard Equipment.

THERE is no evidence of "dull times" in the finely equipped plant of Chisholm, Boyd & White, Chicago. We learned, on the contrary, that they had plenty of work on hand in filling present orders, and had several contracts ahead. The season has been a good one for them, and we congratulate them on their success, which, by the by, is not earned by halfway measures, but by energetic business enterprise.

"WORDS of cheer are ever welcome," and we quote the following letter from a well-known concern: —

"The April issue of THE BRICKBUILDER at hand, and must congratulate you on its fine appearance. It is decidedly *fin de siècle*."

"Business is good with us, and we are at present constructing several large plants. We expect to do more with the assistance of your enterprising paper.

"Yours truly,
"THE SIMPSON BRICK PRESS CO.
"Chicago."

BICKEL BROS. CONTRACTING COMPANY, St. Louis, Mo., are putting a kiln upon the market that is spoken of in highest terms by those using it. The kiln is built on scientific plans, and is eminently practical in operation, being the outcome of long experience in the proper arrangement of kilns, as demonstrated by actual test. The kiln is built strong and to any size desired, is adapted to burning all kinds of brick and pottery goods. Being simple and economical in operation, it does not require an expert to handle it. Any burner who understands his business can easily manage it.

WE are in receipt of a letter from a manufacturer asking if clays are likely to be injured in drying processes by machinery. In reply we clip the following extract from the *British Clayworker*, April, 1894, London, England: —

"It at once occurred to our representative that there might be a danger of driving off the water of hydration as well as that of porosity, in which case the clay would be 'porished,' as the clay-workers say, and its strength and plasticity seriously impaired. Accordingly, Mr. Cummer and Mr. Erith, who were present, gave him leave to take away any portion of the dried clay for examination. This was done, and the sample analyzed in the laboratory, with the result that the clay, though dry, was found to be absolutely uninjured. So much for the scientific opinion, and in addition it may be noted that the proprietors of the works that our representative visited, where this machine is in operation, are well pleased with their investment, and none are more competent to give a practical opinion."

We would add that the dryer referred to above was that manufactured by F. D. Cummer & Son, Cleveland, O.

THE progressive, "get there" clayworkers of this country are ever on the watch for increasing their sales as well as making stock to fill them. They watch the market and are alive to every opportunity of placing new orders. They appreciate that the market side is the important side, and they are working to develop it, knowing that equipment for increased output is easily obtainable. THE BRICKBUILDER naturally interests and appeals to this class of the clayworking community, and it is this class that keep their equipment abreast of the times.

Clay Materials.

WHERE is Philadelphia? Just outside the Jarden Brick Company's yard.

MESSRS. PFOTENHAUER & NESBITT, Metropolitan Building, New York, have taken the New York agency for the Jarden Brick Company of Philadelphia.

THE American Enamel Brick and Tile Company, Wm. A. Pfingsthorn, secretary and treasurer, Mohawk Building, New York, who have produced some of the handsomest enamelled brick yet seen, expect to complete their new factory and begin operations Oct. 1.

MR. H. F. MAYLAND, formerly of the firm of Engelhardt & Mayland, takes up the sole selling agency of the Industrial Brick Company of May's Landing, N. J. This company manufactures a particularly fine grade of front brick in all colors. A full line of samples may be seen at Mr. Mayland's office, 613 United Charities Building 287 Fourth Avenue, New York City.

THE Akron Vitrified Pressed Brick Company, Akron, O., write us that they are receiving many good orders from different section of the country, where their bricks have been used before. This must certainly be gratifying to the company, for it shows that the merits of their bricks are appreciated, and winning for themselves an enviable reputation wherever they are placed.

THE Somerset and Johnsburg Manufacturing Company, Boston, inform us that they have completed the shipment of enamel bricks that are to go into the Carnegie library, Pittsburg. Their contract was for some ninety thousand white enamel brick, many of which were of special shape. More than half of the brick are already set, and the company have received many gratifying comments on the same.

MR. W. H. GATES of Boston has added another string to his bow by practically absorbing the Gay Head Clay and Brick Company, formerly the Chelsea Fire Brick Works of Chelsea, Mass. He has just closed a contract under which he takes the entire product of the works. The capacity of the plant has been increased and Mr. Gates stands in a position to talk business with any one wanting fire brick, cupola blocks, boiler tiles, special shapes, etc., as well as everything in the front brick line.

THE new Jefferson Hotel of Richmond, Va., Messrs. Carrère & Hastings, architects, is being built of a white brick made by the Powhatan Clay Company of the same city. The brick differs from other white brick, inasmuch as the face, although not rough, is not intended to be absolutely smooth, and its color is not a glaring white, but rather more of a delicate cream tint. The effect when laid in the wall is beautiful. Part of the walls was laid last December and as yet has shown no signs of greening.

THE enamel terra-cotta front that is to go into the Reliance Building in Chicago will make that building one of great interest to the building fraternity. It is by far the largest undertaking in enamel terra-cotta construction that has ever been made. The terra-cotta is to be supplied

THE SIMPSON BRICK PRESS.

The only American brick machine to receive
official recognition from the authorized judge
on brick machinery at the . . . . . .

WORLD'S COLUMBIAN EXPOSITION.

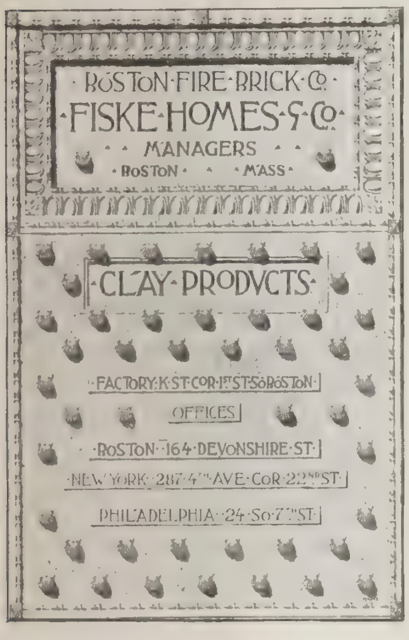
It is replete with time and labor saving devices, and its product always commands the highest market price by reason of their beauty and hardness.

In no single detail of its *simple*, *powerful* and *ingenious* mechanism is this press susceptible of improvement. We are also manufacturers and dealers in full brick-yard equipments, and are prepared to estimate on and construct complete plants. We are also prepared to test all brick-making material sent to our address in Chicago. For prices, terms and other information, address,

THE SIMPSON BRICK PRESS CO.,
No. 415 Chamber of Commerce Building, - - - - Chicago, Ill.
Agents for Canada, WATEROUS ENGINE WORKS CO., Brantford.

by the Northwestern Terra-cotta Company, Chicago. From the specimens of the enamel work which we saw at the company's factory, we predict a grand effect when the building is complete.

It is fair to presume that a great popularity will follow this kind of structure.



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The above cut is a reduced fac-simile of the cover design of Fiske, Homes & Co.'s new catalogue. It is a very handsome publication, and an example of the work of the Collins Press, whose creditable work is apparent in THE BRICKBUILDER. This catalogue illustrates buildings furnished with clay materials by Fiske, Homes & Co., a series of fine brick and terra-cotta mantels, one of which is illustrated on page 120, numerous stock patterns of terra-cotta detail, etc., etc.

THE "brickyard" of to-day would be indeed a revelation to any one visiting it for the first time. With its modern appliances for drying and burning, its ponderous machines for pressing the brick, producing thousands per day for each machine, its blacksmith and machine shops, and its corps of skilled foremen and draughtsmen, it has taken its place among the leading industries of our time.

To successfully operate such a plant, representing an investment of hundreds of thousands of dollars in many cases, where economy in production and quality of same are the essential elements of success, requires the most careful attention to every detail. One of the largest companies in this section of the country is the Eastern Hydraulic-Press Brick Company of Philadelphia, Mr. Henry Mack, manager. To those who are interested in the modern method of brickmaking, Mr. Mack takes great delight in showing over the company's works, which are situated at Winslow Junction, N. J., near Philadelphia.

A NEW concern that is sure to take its place among the leaders in its line is the Excelsior Terra-Cotta Company. This company was organized Feb. 1, 1894, to succeed Messrs. Partridge, Powell & Storer. The offices of the company are at 287 Fourth Avenue, New York, and its factory at Rocky Hill, New Jersey, on the Delaware & Raritan Canal, about half way between Philadelphia and New York. The clay which is taken from the beds owned by the company is pronounced by experts to be of the finest quality. The location of the company's works could not be excelled for shipping purposes, as transportation is obtained by rail or water, and being about half way between the two large cities named.

The president of the company is Mr. Isaac A. Hopper, a successful New York business man and well known as the president of the Master Builders' Club of New York; vice-president, Col. A. N. Partridge of Brooklyn; treasurer and sales agent, Mr. W. H. Powell, formerly with the Perth Amboy Terra-Cotta Company.

Miscellaneous.

THE new home of the Baltimore Builders' Exchange meets all the requirements, and so does Secy. E. D. Miller.

MR. ANTHONY ITTNER of St. Louis has put a line of mortar colors on to the market. They are as good as his brick, and no higher praise could be given them.

MR. CHARLES HEWITT, well known as the president of the New Jersey Steel and Iron Company, Trenton, N. J., has been elected president of the Metropolitan Fire-Proofing Company, formerly the Manhattan Fire-Proofing Company.

MR. MORRIS EBERT of Philadelphia, American agent for the Mannheimer Cement, reports that during the past year he imported double the amount of this cement of any previous year, which must be allowed is good evidence that this excellent German brand is meeting all the stringent requirements for building.

THE Expanded Metal Company are putting on the market a very valuable process wherein a metal mesh is used for fireproof lathing. The principle is that of a net or mesh, peculiarly constructed and so designed that it contains the best qualities of a proper surface to plaster and cement upon. By using light, three-quarter-inch steel channels, set sixteen inches apart, and then sheets of expanded metal lashed to them, a foundation for their new scheme of solid plaster partitions is formed. The extreme lightness of the structure, its fireproof qualities, and the fraction of space occupied are a strong recommendation in its favor. A number of buildings have used this expanded metal mos- satisfactorily, among which may be ment tioned the Carter Building, the Penn Mutual Insurance Building, and the new Boston & Maine Station; and the new Tremont Temple will have this construction throughout.

MR. H. E. STREETER of 13 Exchange Street, Boston, has been seen recently with a common brick of high enough quality to serve in most cases as a face brick. It is the product of the Hartford Brick Company, and one of the best common sand struck brick we have seen. It can be delivered f. o. b. in Boston for about $8.50, and the orders Mr. Streeter has already placed will start a good many carloads this way. Any one in New England wanting a particularly fine line of such brick will find it to their advantage to let Mr. Streeter make them a price.

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THE BRICKBUILDER

Vol. III. BOSTON, JULY, 1894. No. 7.

MUNICIPAL REQUIREMENTS FOR THE THICKNESS OF WALLS.

As the laws regulating the construction of buildings in our larger cities have, as a rule, been prepared with great care by men who have had much experience in building construction, and who in many cases are acknowledged experts, a comparative study of these laws as far as they relate to the thickness of brick walls ought to bring out much interesting information, besides, in a general way, giving comparative values of the brickwork in different sections of the country. It should be remembered that these thicknesses were arrived at almost entirely as the results of experience, and not by empirical or mathematical rules or formulas. Neither has the strength of the brickwork been in all cases the controlling consideration, as the effect of the action of fire in imperilling the stability of the wall has in most cases caused the thickness to be increased over what would be necessary for strength under ordinary conditions. As an instance of this, there are many old four-story dwellings in Boston with swell fronts which have only eight-inch walls, and which have stood for fifty years without developing a crack, but to-day it would be impossible to erect such buildings in any large city without increasing the thickness of the walls, although eight-inch walls thirty-three feet high are still permitted in Boston. At present, the thickness of walls required in Boston is greater than that in any other city having equally as good brick, and, in fact, thicker than in many cities having much poorer brick.

It is well known that thick walls resist the action of fire and water much better than thin ones; they also add greatly to the stability of high buildings.

In regulating the thickness of walls for buildings, it is customary to classify the buildings according to the purpose for which they are to be used, giving a different thickness to the different classes. In most cities three classes of buildings are recognized; viz., dwellings, business buildings or warehouses, and public buildings. When the last are classed separately, the thickness of the walls is left in a great measure to the discretion of the building inspector, as no general rule can be made to apply to them. The other two classes may be distinguished by the terms, "dwellings" and "warehouses." The kind of buildings grouped under these classifications, however, differ greatly in different cities, as will be seen from the following schedule of five representative cities.

BUILDINGS CLASSED AS DWELLINGS.

Boston: Private residences only.

New York: Residences, tenement houses, apartment houses, hotels, and schoolhouses.

Chicago: Residences, tenement houses, boarding or lodging houses, hotels, and office buildings.

Minneapolis: Dwelling houses only (meaning of term not defined).

*Denver:** Same as in Chicago, except that *all* buildings over eight stories high are classed as warehouses.

BUILDINGS CLASSED AS WAREHOUSES.

Boston: All buildings other than dwellings.

New York: Warehouses, stores, office buildings, factories, and stables.

Chicago: All buildings devoted to the sale, storage, or manufacture of merchandise, and all stables.

Minneapolis: Business, manufacturing, and public buildings.

Denver: Same as Chicago, except that stables covering less than twelve hundred square feet are classed with dwellings.

Minneapolis and Milwaukee make a third classification, which especially provides for buildings in which the first story is occupied for business purposes, and the stories above as dwellings.

It will be noticed that Chicago and Denver are at present the only two cities which put dwellings and office buildings under the same classification,† although New York comes very near it, in including hotels. There appears to be no good reason, however, why the walls of a dwelling should not be as thick as those of any office building of the same height and area, or, *vice versa*, why the latter should have thicker walls than a dwelling. The line loads on both are about the same, and there is nothing to cause an outward thrust against the walls. Private residences are seldom over five stories high, so that above that limit they practically drop out, and it is generally admitted that the walls of high buildings should be thicker in proportion than those of low ones. Although opinions may differ in regard to the classification of office buildings, it seems as though there can be no good reason for making a distinction between dwellings, tenement houses, flats, and hotels, as they are all, essentially, dwelling houses.

The following table shows the thickness of walls for buildings classed as warehouses in the cities above named, and also in Memphis. In compiling this table, the top of the second floor has been taken at nineteen feet above the sidewalk, and the height of the other stories at thirteen feet four inches, including the thickness of the floor, as the New York and Boston laws give the height of the walls in feet, instead of in stories. If the stories were greater than these, the thickness of the wall in some cases would have to be increased.

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*The law here quoted was prepared by a committee of the Colorado chapter of the A. I. A., and has not yet been adopted by the city council, but undoubtedly will be within a short time.

† In Denver, an especial provision is made for small brick houses.

THICKNESS OF WALLS IN INCHES FOR WAREHOUSES, ETC.

HEIGHT OF BUILDING.		STORIES.											
		1st	2d	3d	4th	5th	6th	7th	8th	9th	10	11th	12th
Two Stories.	Boston . . .	16	12	...	...	...	...	...	...	...	...	...	...
	New York .	12	12	...	...	...	...	...	...	...	...	...	...
	Chicago . .	12	12	...	...	...	...	...	...	...	...	...	...
	Minneapolis	12	12	...	...	...	...	...	...	...	...	...	...
	Memphis . .	18	13	...	...	...	...	...	...	...	...	...	...
	Denver . .	13	13	...	...	...	...	...	...	...	...	...	...
Three Stories.	Boston . . .	20	16	16	...	...	...	...	...	...	...	...	...
	New York .	16	16	12	...	...	...	...	...	...	...	...	...
	Chicago . .	16	12	12	...	...	...	...	...	...	...	...	...
	Minneapolis	16	12	12	...	...	...	...	...	...	...	...	...
	Memphis .	22½	18	13	...	...	...	...	...	...	...	...	...
	Denver . . .	17	13	13	...	...	...	...	...	...	...	...	...
Four Stories.	Boston . . .	20	16	16	16	...	...	...	...	...	...	...	...
	New York .	16	16	16	12	...	...	...	...	...	...	...	...
	Chicago . .	20	16	16	12	...	...	...	...	...	...	...	...
	Minneapolis	16	16	12	12	...	...	...	...	...	...	...	...
	Memphis . .	27	22½	18	13	...	...	...	...	...	...	...	...
	Denver . . .	21	17	13	13	...	...	...	...	...	...	...	...
Five Stories.	Boston . . .	20	20	20	20	16	...	...	...	...	...	...	...
	New York .	20	16	16	16	16	...	...	...	...	...	...	...
	Chicago . .	20	20	16	16	16	...	...	...	...	...	...	...
	Minneapolis	20	16	16	12	12	...	...	...	...	...	...	...
	Memphis . .	31½	27	22½	18	13	...	...	...	...	...	...	...
	Denver . .	21	21	17	17	13	...	...	...	...	...	...	...
Six Stories.	Boston. . . .	24	20	20	20	20	16	...	...	...	...	...	...
	New York .	24	20	20	20	16	16	...	...	...	...	...	...
	Chicago . .	20	20	20	16	16	16	...	...	...	...	...	...
	Minneapolis	20	20	16	16	16	12	...	...	...	...	...	...
	Memphis . .	36	31½	27	22½	18	13	...	...	...	...	...	...
	Denver . . .	26	21	21	17	17	13	...	...	...	...	...	...
Seven Stories.	Boston . . .	24	20	20	20	20	20	16	...	...	...	...	...
	New York .	28	24	24	20	20	16	16	...	...	...	...	...
	Chicago . .	20	20	20	20	16	16	16	...	...	...	...	...
	Minneapolis	20	20	20	16	16	16	12	...	...	...	...	...
	Memphis . .	40½	36	31½	27	22½	18	13	...	...	...	...	...
	Denver . . .	26	21	21	21	17	17	17	...	...	...	...	...
Eight Stories.	Boston . . .	28	24	20	20	20	20	20	16	...	...	...	...
	New York .	32	28	24	24	20	20	16	16	...	...	...	...
	Chicago . .	24	24	20	20	20	16	16	16	...	...	...	...
	Minneapolis	24	20	20	20	16	16	16	12	...	...	...	...
	Memphis . .	45	40½	36	31½	27	22½	18	13	...	...	...	...
	Denver . . .	30	26	21	21	21	17	17	17	...	...	...	...
Nine Stories.	Boston . . .	28	24	24	20	20	20	20	20	16	...	...	...
	New York .	32	32	28	24	24	20	20	16	16	...	...	...
	Chicago . .	24	24	24	20	20	20	16	16	16	...	...	...
	Minneapolis	24	24	20	20	20	16	16	16	12	...	...	...
	Memphis . .	49½	45	40½	36	31½	27	22½	18	13	...	...	...
	Denver . . .	30	26	26	21	21	21	17	17	17	...	...	...
Ten Stories.	Boston . . .	28	28	24	24	20	20	20	20	20	16	...	...
	New York .	36	32	32	28	24	24	20	20	16	16	..	...
	Chicago . .	28	28	24	24	24	20	20	20	16	16	...	...
	Minneapolis	24	24	24	20	20	20	16	16	16	12	...	...
	Memphis . .	54	49½	45	40½	36	31½	27	22½	18	13	...	...
	Denver. . .	30	30	26	26	21	21	21	17	17	17	...	...
Eleven Stories.	Boston . . .	32	28	28	24	24	20	20	20	20	20	16	...
	New York .	36	36	32	32	28	24	24	20	20	16	16	...
	Chicago . .	28	28	24	24	24	20	20	20	16	16	16	...
	Minneapolis	28	24	24	24	20	20	20	16	16	16	12	...
	Denver . . .	30	30	26	26	26	21	21	21	17	17	17	...
Twelve Stories.	Boston . . .	36	32	32	28	28	24	20	20	20	20	20	16
	New York .	40	36	36	32	32	28	24	24	20	20	16	16
	Chicago . . .	28	28	28	24	24	24	20	20	20	16	16	16
	Minneapolis	28	28	24	24	24	20	20	20	16	16	16	12
	Denver . . .	30	30	30	26	26	26	21	21	21	17	17	17

The maximum height of stories permitted by the Chicago ordinance with these thicknesses of walls is eighteen feet in first story, fifteen in second, thirteen and a half in the third, and twelve feet in the stories above.

It will be seen from the above table that Memphis has much the heaviest walls of any city, which presumably is on account of poor material; Boston ranks second, and Minneapolis has the thinnest walls. The Chicago ordinance, however, provides that if the depth of the building is less than one hundred feet, and the width less than twenty-six feet, the thickness of the walls may be reduced four inches which would make them thinner than the Minneapolis requirements.

New York permits the front and rear walls to be four inches less in thickness than in the table, but in the other cities mentioned all external walls are required to be of the same thickness. Although there is a great difference in the thicknesses above given, more indeed than there should be, for we ought to be able to agree more closely on what is required for the safety of buildings, at least; yet a general rule might be deduced from the table for building over four stories in height, which would be something as follows: —

For brick equal to those used in Boston or Chicago make the *thickness of the three upper stories sixteen inches*, of the next three below twenty inches, the next three twenty-four inches, and the next three twenty-eight inches. For a poorer quality of material, make only the *two* upper stories sixteen inches thick, the next three twenty inches, and so on down.

In buildings less than five stories in height, the top story may be twelve inches in thickness.

Without quoting further from the building regulations the following general principles will be found to be recognized in all of the later laws: —

First, That walls of warehouses and mercantile buildings should be heavier than those used for living or office purposes.

Second, That high stories, and clear spans exceeding twenty-five feet, require thicker walls.

Third, That the length of the wall is a source of weakness, and that the thickness should be increased four inches for every twenty-five feet over 100 or 125 feet in length. (In New York, the thicknesses in the table must be increased for buildings exceeding 105 feet in depth. In the Western cities, the tables are compiled for warehouses 125 feet in depth, as that is the usual depth of lots in Western cities.)

Fourth, That walls containing over thirty-three per cent of openings should be increased in thickness.

Fifth, Partition walls may be four inches less in thickness than the outside walls if not over sixty feet long, but no partition to be less than eight inches thick.

Sixth, That when brick of sufficient strength are available, the stability of the wall, particularly in case of fire, is increased by supporting the floor joist on ledges corbelled from the wall. (This is obligatory in Chicago for warehouse walls twelve and sixteen inches thick, and for eight and twelve inch walls in dwellings.)

PARTY WALLS.

There is much diversity in building regulations regarding the thickness of party walls, although they all agree in that such walls should never be less than twelve inches thick. About one half of the laws require the party walls to be of the same thickness as external walls; the remainder are about equally divided between making the party walls four inches thicker or thinner than for independent side walls.

When the walls are proportioned by the rule previously given, the writer believes that the thickness of the party walls should be increased four inches in each story. The floor loads on party walls is obviously twice that on side walls, and the necessity for thorough fire protection is greater in the case of party walls than in other walls.

F. E. KIDDER.

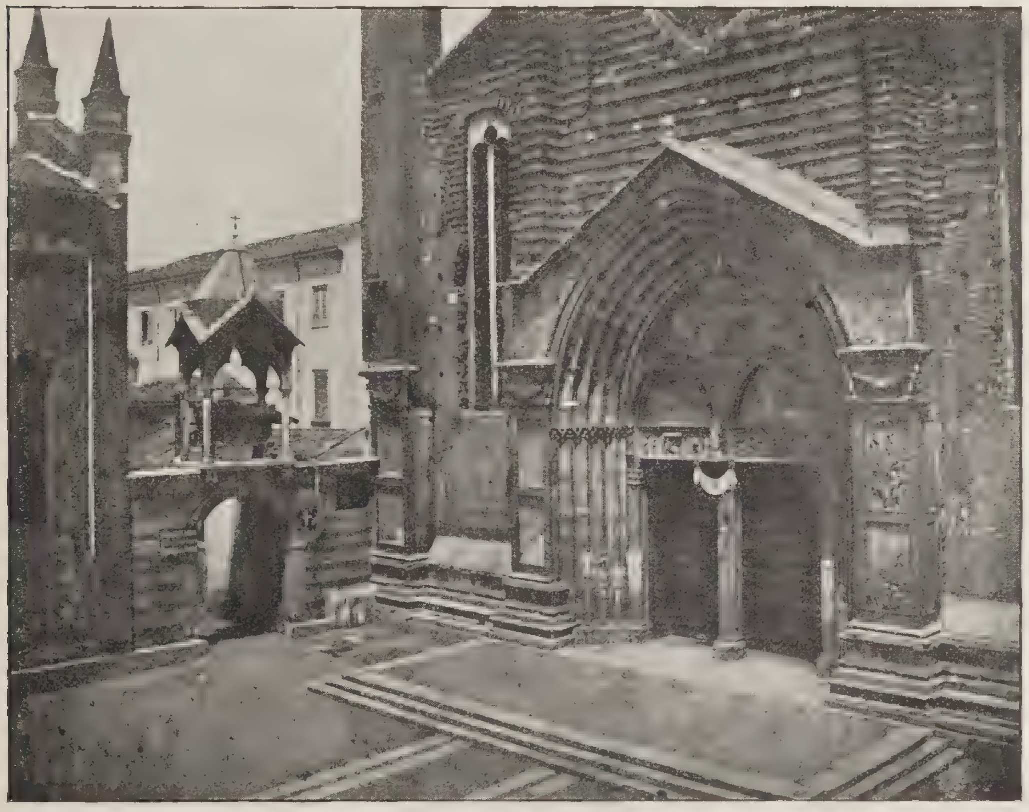
TERRA-COTTA CAPITAL.
FISKE, HOMES & CO., MAKERS, BOSTON.

BRICK AND MARBLE IN THE MIDDLE AGES.

(*Continued.*)

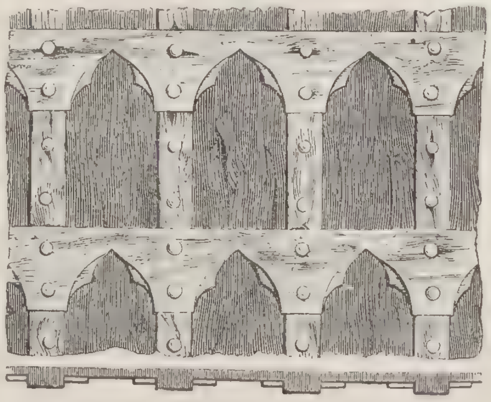
CHAPTER VI. — CONTINUED.

THE west front of the church stands in a small piazza, on the north side of which is the little church of San Pietro Martire, between the east end of which and Sta. Anastasia is a wall dividing a small burial ground from the Piazetta. On the top of this wall, and supported upon corbels, is one of those monuments peculiarly associated with Verona, because so numerous there, though they are often met with elsewhere in Italy. They are either large, pyramidal canopies supported upon trefoiled arches, resting on four marble shafts, with a kind of sarcophagus or an effigy beneath; or else, when attached to a wall, they have two detached shafts supporting the same kind of trefoiled arch and surmounted by a flattish pediment. Their effect is almost invariably beautiful in the extreme, and their only defect is that they all require to be held together by rods of iron connecting the capitals of the columns. This, however, is soon forgotten when one feels that there is no pretence ever or anywhere at its concealment; and, notwithstanding this slight defect, one cannot help loving and admiring them, for there is a grace and beauty about the form and proportion of the Veronese trefoiled arch such as is never seen, I think, elsewhere, and the very flatness of the carving and the absence of deep moulding seem all adopted in order that nothing may interfere with the simple beauty of the outline of the arch. In this case the monument is supported on a large slab of stone corbelled forward and balanced upon the top of a thin wall over the archway which leads into the churchyard of San Pietro. Four shafts with sculptured capitals, resting on the angles of this slab, support four trefoiled arches (those at the ends narrower than the others), which are almost destitute of moulding, save that the outer line of the arch has a broad band of delicate sculpture all round it. The arch terminates in a small cross, and above on each side is a very flat pediment, moulded and finished on the under side with one of the favorite Italian arcaded corbel tables; the finish is a heavy pyramidal mass of stone rising from behind the pediments. The four bearing-shafts are of white marble, all the rest of the monument of red. Within the four supporting shafts stands the sarcophagus, supported on the backs of couchant lions, very plain, but ornamented at the angles in very classic fashion, and bearing a recumbent effigy.



WEST FRONT OF STA. ANASTASIA AT VERONA, SHOWING CORNER OF S. PIETRO MARTIRE.
SUPPLEMENTARY ILLUSTRATION TO "BRICK AND MARBLE IN THE MIDDLE AGES."

The church of San Pietro has three or four smaller monuments enclosed within its small courtyard. Two of them are on the ground and have round arches on detached shafts with an Agnus Dei carved in the centre. The third is corbelled out from the wall, and the face of the monument is covered with sculpture, that of the figures being very inferior in style to that of the foliage enrichments. This little group of monuments, varying in date from 1283 to 1392, is well worth study, and I found it more than usually interesting, owing to its entire unlikeness to any English work. The church against which these monuments are built is small, but deserves notice; it is of brick, with a stone canopy on shafts corbelled out above the west door; the buttresses are mere pilasters, and run up without any weathering till they finish in an arcaded corbel table at the eaves; the windows have wide brick splays outside, and trefoil heads of stone without any chamfer or moulding. On the south side, the church — in point of size a mere chapel — is divided into four bays, one of which has a monument corbelled out by the side of the window. It is built entirely of red brick, not relieved in any way, except that the window arches are in alternate voussoirs of brick and stone. The wooden framework of the west door deserves notice as being very unlike the English mode of door-framing, and very good in its effect. The accompanying sketch will best explain it, and it must be understood that, instead of being internal, as such framing would usually be in England, in this example it is external, just as in the somewhat similar door of Sta. Anastasia, of which I have already made mention.



Turning back from the Piazzetta of Sta. Anastasia, and traversing again the narrow and gratefully shady street by which we reached it, we soon found ourselves at the end of the Piazza dell' Erbe, the most picturesque square in the city, and at an early hour in the morning quite a sight to be seen. The whole open space was as full as it could be of dealers in vegetables and fruits, all of them protecting themselves and their stores from the intense glare of the sun under the shade of prodigious umbrellas, at least five times as large as any of ordinary size, and certainly five times as bright in their colors, the prevailing color being a very bright red. Altogether it was a thoroughly foreign scene. The houses, some ancient, but all picturesque and irregular, surrounding the irregularly shaped piazza, the magnificent campanile of the Scaligeri Palace rising proudly behind the houses on the left, the fountain in the centre, and the great column of red Veronese marble rising close to us, which at one time bore the winged lion, — mark of the dominion of the Venetians, — all combined to produce a very striking picture. An hour or two later in the day when we passed, the people, the umbrellas, and the fruit were all gone, and somewhat of the charm of the place was gone with them.

From the Piazza dell' Erbe we went to the cathedral, anxious to see and hear somewhat of a service which we found was to take place. There was a great throng of people, and we had some difficulty in finding even standing room among them; we were not at all sorry, however, to have gone, for we came in for a sermon most energetically preached, and enforcing in very powerful language the necessity of repentance. The pulpit was very large, and as the preacher delivered his sermon, he walked from side to side, and often repeated again to those on his left the substance of what he had already said to those on his right. The people, who crowded every available place within hearing, were exceedingly silent and attentive, and at intervals the preacher stopped for a minute to cough and use his handkerchief, which was a signal for an immediate general blowing of noses and coughing all over the church. The "Ebben infelici!" with which he commenced his sermon was a good index to its whole tone, and makes me remember with pleasure the vast crowd listening to Christian doctrine in the grand nave of the Duomo. Would that we could see any prospect of the day when in England our larger churches may be used in this way, when, with pews and all their concomitant evils swept away, we may see a vast crowd standing and sitting, leaving no passageway and no waste room, anxious only that they may, by pressing near, join in the services at the altar, and hear every word of warning and of advice! The nave of Westminster, so thronged, would soon show how great has been our mistake in leaving our large churches so long unused.*

The Duomo is a really fine church, Romanesque in its shell, but altered completely internally in the fourteenth century. It has only five bays in length, but the dimensions are so large that the nave and aisles alone measure about 225 feet by 97 feet inside. There are slightly recessed Romanesque apses in the side walls, and a great tomb or shrine of St. Agatha, which is worth looking at. The columns in the interior are very lofty, of red marble, and, instead of being plain and cylindrical, as at Sta. Anastasia, are moulded with very good effect. Their capitals are, however, heavy, and the carving of the foliage on them not at all satisfactory. The whole interior is very solemn, and specially beautiful on this bright September day, with almost all the light excluded by thick curtains, here and there a stray gleam of the most intensely bright light finding its way through some chink, lighting up, with sudden brilliancy, the deep, cool shade, and — reflected from the bright surface of some great marble shaft — suggesting the grandeur which can hardly really be seen.

The choir is divided from the nave by a screen of marble, consisting of detached columns with Ionic capitals and a continuous cornice, the whole screen semicircular in plan, and coming forward into the nave. This, the work of Sanmichele, is certainly about the most effective work of this kind and age that I have seen.

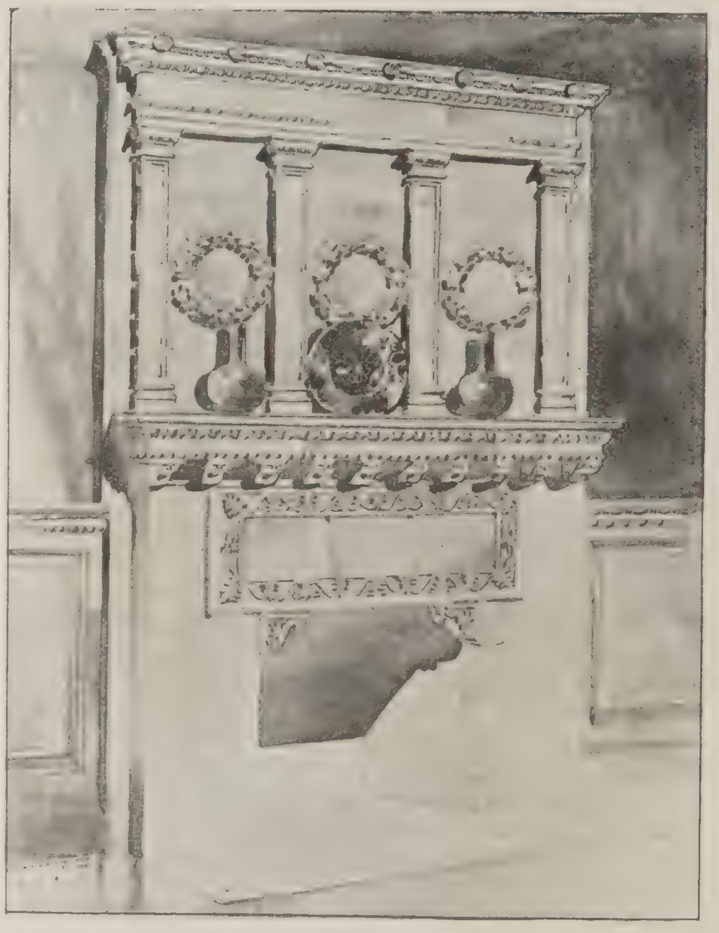
The west front of the Duomo is still in the main in its original state. It has a rich porch supported on shafts (whose bases rest on the backs of lions), and of two stages in height, a flat pediment surmounting the upper stage. Another flat pedimental cornice is carried over the whole front at the same level; but out of this a wall rises above the central portion the width of the nave, and height of the clerestory, which is again surmounted by a third flat pediment — a confused and not very graceful arrangement, which found an imitator in Palladio, when he built that ugliest of fronts, the west end of San Giorgio Maggiore at Venice.

The windows at the ends of the aisles are very Italian in their character. They are insertions in the wall of two narrow lights within an enclosing arch, which is again surrounded by a square line of moulding. The effect of this not uncommon Italian arrangement is exceedingly unsatisfactory, as it appears to make the window with its arch and tracery quite independent, constructively, of the wall in which it is placed; it appears in fact to be merely veneered on to the face of the wall.

On the north side of the cathedral is a cloister of good detail, which was originally of two stages in height, but is now considerably altered in parts. It is exceedingly similar to the cloister of San Zenone, which we shall see presently, consisting of a long arcade of pointed arches carried on marble shafts; it is now in a very ruinous condition.

The Baptistery — San Giovanni in Fonte — is a detached church near the east end of the cathedral, which does not look as if it had been at first intended for its present use. It is a building of the twelfth century, with nave and aisles ending in three apses, lighted by a small clerestory, and with some columns which are probably Roman. The font, which stands in the centre, is of enormous size, and is sculptured with eight subjects, beginning with the Annunciation and finishing with the Baptism of our Lord. These sculptures are very rude. The bason of the font is almost seven feet in diameter, and in its centre is another smaller bason of graceful shape. I do not happen to have seen an explanation of these inner basons in the fonts in Italian baptisteries. They look as if they were meant for the priest to stand in whilst he immersed the catechumens around him.

(*To be continued.*)



MANTEL.

DESIGNED BY J. A. SCHWEINFURTH.

Made by Fiske, Homes & Co., Boston, and carried in stock in Brick and Terra-Cotta in a variety of colors, both glazed and unglazed.

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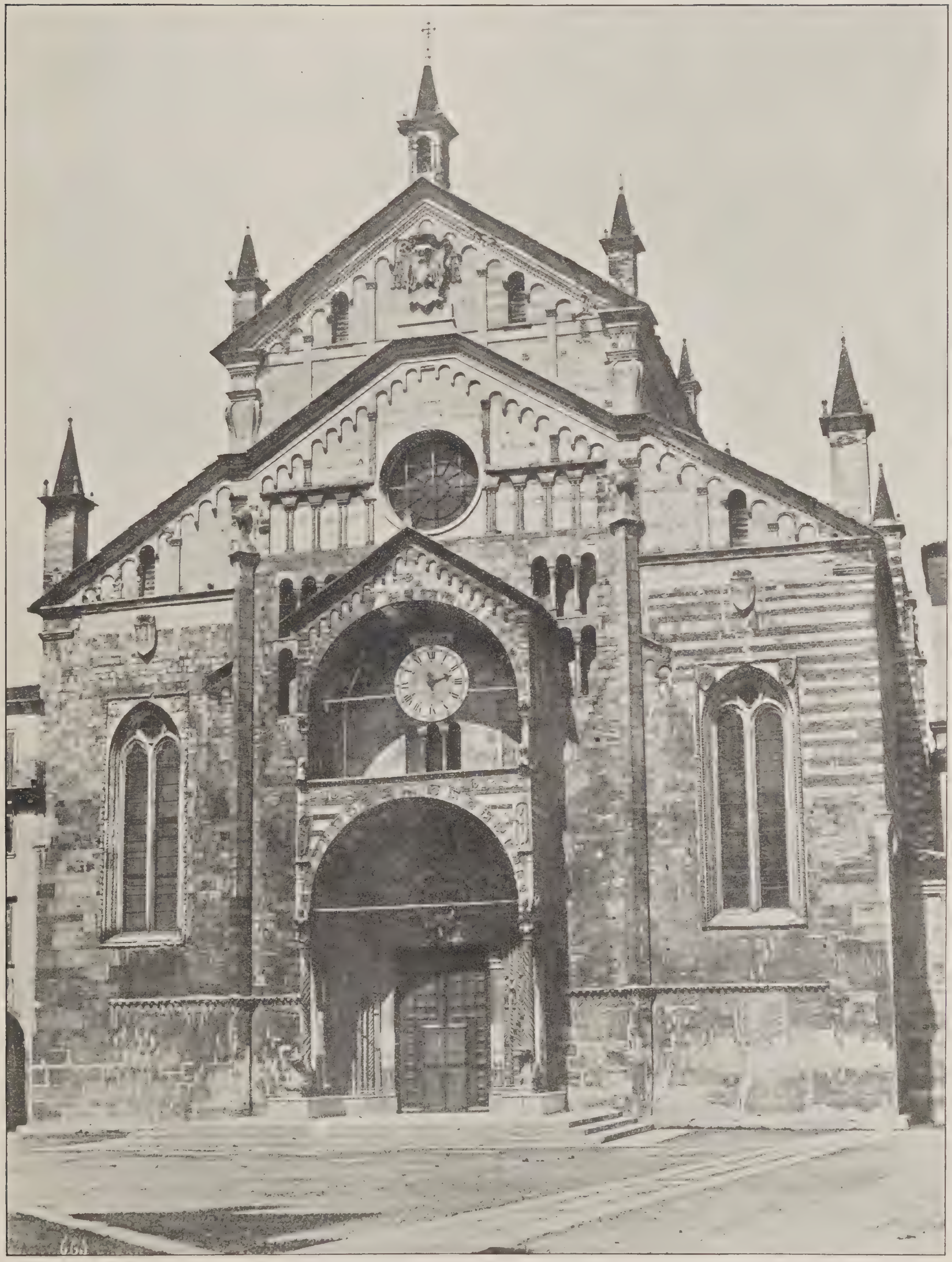
* I leave this passage as it originally stood. It is pleasant to feel how completely unnecessary it is now to use such language on the subject.



WEST FRONT OF THE CATHEDRAL, VERONA.
Supplementary Illustration to "Brick and Marble in the Middle Ages."

THE ART OF BUILDING
AMONG THE ROMANS.

Translated from the French of Auguste Choisy by

ARTHUR J. DILLON.

CHAPTER II.—CONTINUED.

IN speaking of ancient walls, we said the Romans had two kinds of masonry at their disposal, unrammed and rammed, and we noticed that only the first could be used for constructing walls with revetments of their bricks, because it alone could be made without auxiliary works, casings, or removable sheathing. The same conditions governed the building of vaults, and enable us to foresee which of the two kinds of masonry would be used in their construction. In building the vaults, the erection of an interior shell or mould to give the necessary shape to the rubble could not be avoided; but even if this shell or mould was indispensable, if, in other terms, a centring was necessary, an endeavor at least could be made to make it as cheap as possible; from this consideration the Romans decided as to which of the two kinds of masonry they would use. If they used rammed or tamped masonry they would have exposed the centring to shocks quite capable of loosening its assemblage, and, above all, there was the danger that the centring would be greatly deformed; near the springing it would have been strongly pressed together, while the outer revetments would at the same time be forced outward. (Fig. 11.)

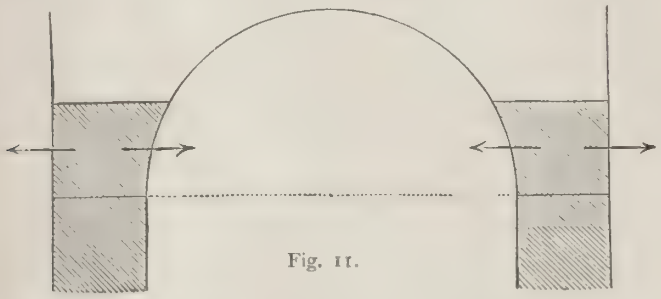


Fig. 11.

To resist such pressure it would have been necessary to build not only an interior centring, but also an exterior casing; and, indeed, every part of the temporary scaffolding would have had to be made solid to an extreme, in order to withstand the spreading due to the incessant shocks of the ramming. With these difficulties in view, evidently the wisest course was to avoid construction by ramming. This was the conclusion to which the Romans came; and everywhere that I have been able to make sure of the nature of its construction, the masonry of their vaults was made by exactly the same processes as that of their ordinary walls. Sometimes the materials used in the vaults were lighter than those of the walls, but the methods of using them were the same in both cases, and the masonry of vaults was never rammed.

Notwithstanding that the construction had been chosen in order to save centring, the pressure the vaults exerted on the supports was still very great in certain cases. As long as the masonry was only a little above the springing, it practically sustained itself, the successive courses corbelling out and tying, as it were, the overhanging portion A B S to the continuation of the imposts along A B (Fig. 12). The form of this portion A B S is not, in fact, greatly different from the theoretical profile to be given to a projecting solid which has to bear only its own weight, and, therefore, it was neither a difficult nor costly affair to sustain it. This lower part of the vault could, in case of necessity, have been built with any scaffolding except what would be sufficient to mould it and to give it the proper curvature; but this facility of execution diminished proportionately as the vault rose; the overhanging portions progressively pressing more heavily on the centrings, and the weight augmenting with extreme rapidity as the summit was approached. The vault would soon become a half fluid mass bearing with all its weight on the supporting works; the centring which a moment before seemed almost superfluous, must then be capable of great resistance, and the more perfect as the vaults were more compact and more massive, for the Roman vaults were never slight, the coarse structure of their masonry making it sometimes necessary to give them enormous dimensions. It was furthermore necessary to prop this mass of half-set material with perfectly firm supports, because to leave the masonry as yet in progress of solidifying unsupported was to run the risk of movements in the interior of the rubble, perhaps causing ruptures. In an ordinary vault of radiating keys, though the deflection of the centring is sometimes unfortunate, it is rarely disastrous; some of the beds of mortar may open, but the stability of the structure does not depend solely on the strength of the joints, for the mortar in this kind of vault serves to transmit the pressure, and is not a fundamental part of the masonry, being simply a cushion inserted between the keys; even should it split or disappear entirely the existence of the vault would not necessarily be compromised; its presence is so little necessary that in their cut-stone constructions the ancients never used it.

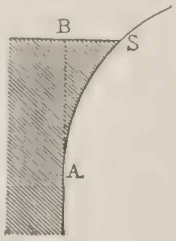


Fig. 12.

But in the rubble vaults of the Romans, mortar did not play this minor part, for it, and it alone, established the bond between the elements of the construction; and this bond once destroyed, there would remain but a shattered monolith, a ruined heap of masonry.

Therefore, to build a vault of small cemented materials, the centring had to be given an absolute stability; this was the first condition of success, and with ordinary centrings and scaffoldings this condition could only be filled with the greatest difficulty.

Accuracy, increase of the amount of wood, multiplication of the props, did not entirely solve the difficulty; for wood, even the best put together, moves, gives, and swells with the least change of temperature, and a monolithic vault incapable of following the deflections of the centring which served as its mould would constantly be threatened by the shrinkage, or eventual weakening of the centring, with a lack of support. I shall add that to give so much importance to temporary work would be out of the ordinary custom of the Roman builders. Accustomed to regard no work as useful except that which was durable, and, moreover, accustomed always to seek the simplest processes and solutions, it would be surprising to find them using such expensive and complicated auxiliary work in one case alone.

Moreover, if one takes into account the organization of the ancient work yards, he will be led by a different course to the same conclusion. At every point of the Empire the Romans had an unlimited number of hands at their disposal, but men who could be intrusted with such important work as centrings were not so easily found. When the masonry to be built called for only a simple expenditure of physical strength, it was easy to recruit the workmen from the population subject to forced labor, the army, and the slaves; but as soon as it was a question of scientific and difficult construction, such as that of rigid and inflexible centrings, their resources were more limited; they would not only be obliged to assemble, at great expense, a large number of skilled artisans, but in addition they would have to resign themselves to unavoidable delays, and when, by dint of money and time, they had succeeded in putting whole forests in place to support the masonry of their enormous vaults without risk of deflection, the day after the work was finished they would find all the cost without direct result, and the whole expensive apparatus would disappear without leaving a trace. Such a profitless expenditure of difficult and costly labor was antagonistic to the practical minds of the Romans; and in their attempts to avoid it, and to escape as much as possible the necessity of a temporary centring, the simple and ingenious idea of giving the vaults this kind of interior scaffolding of brick, which supported the mass during construction, and prevented the masonry from bearing its full weight on the temporary centring, was suggested.

(*To be continued.*)

RECENT BRICKWORK IN AMERICAN CITIES

DENVER.

DENVER is distinctly a city of brick and stone. Within the past five years, during which all of our best buildings have been built, not a single wooden building has been erected. In 1891 and 1892, a few residences were erected with the second story of frame construction, but even these are now prohibited by the building ordinance. Stone, being obtained near the city, in unlimited quantity and good quality, is used almost entirely for trimmings, and many buildings are entirely faced with stone. A few are of solid stone construction. Terra-cotta has been used to some extent, but as the nearest works are over a thousand miles away, the freight, added to the cost of manufacture, makes this material more expensive with us than stone, unless highly enriched, and with the ornamental parts repeated several times. In time, terra-cotta works will undoubtedly be established here, as there is abundance of suitable clay for its manufacture.

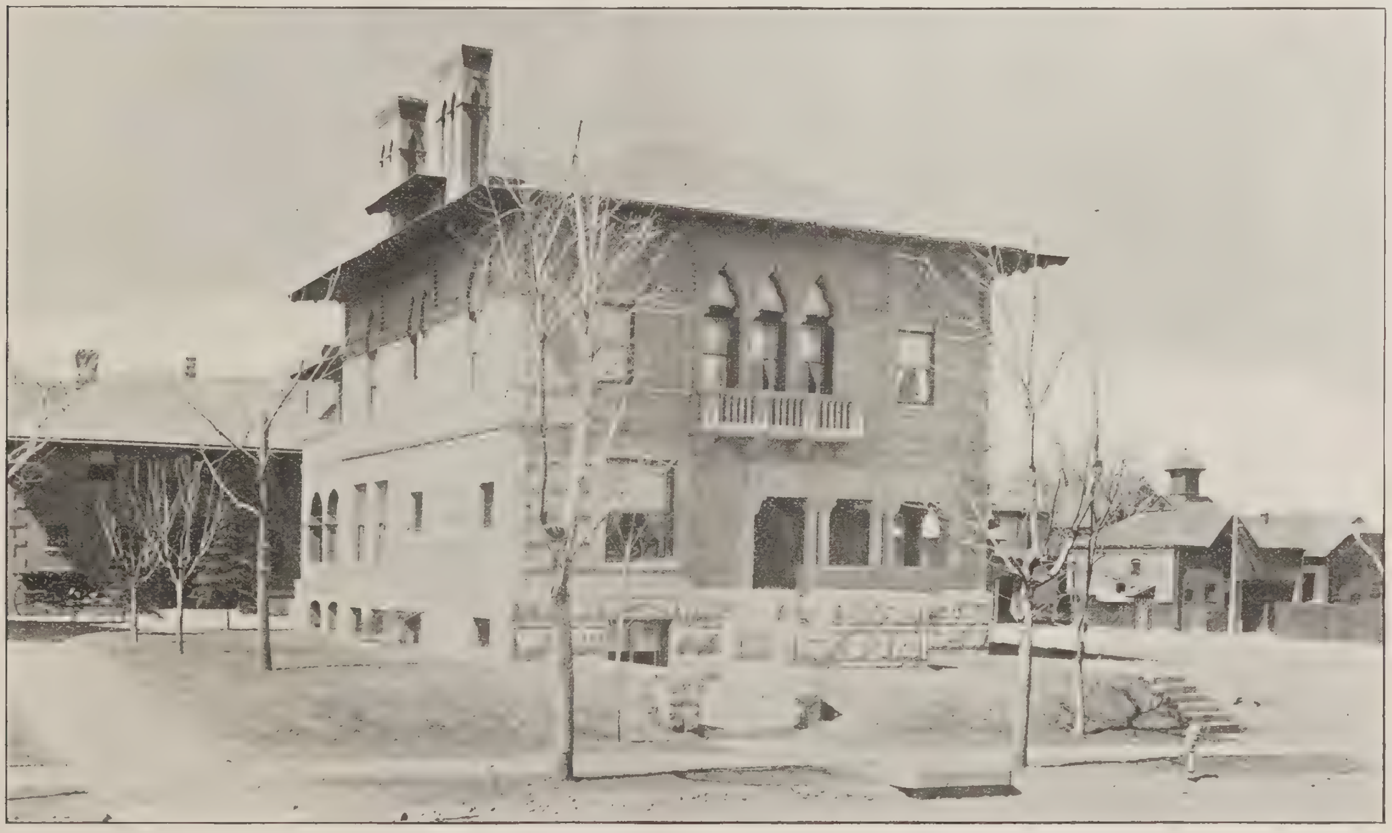
Although brick has been so extensively used for all classes of buildings, there are not many examples of distinctively brick architecture, unless we consider the two and three story flat-roofed buildings as such; but as a rule, they are not examples to be admired or copied.

The better class of recent brick buildings are faced with pressed brick, which are made here in several shades of red, buff, cream, white, and pink.

There are, however, no examples of mottled and variegated brickwork, and whatever shade of brick has been selected, the greatest care has been exercised to select the brick so that the wall shall show a perfectly uniform shade of color, which gives a hard, mechanical appearance, and lacks the artistic effect seen in Eastern brickwork; the great desideratum with the people (I do not think it is always so with the architects) seeming to be to make the work as perfect mechanically as possible. There are also very few buildings in which more than one color of brick has been used, and these as a rule have not proved a success.

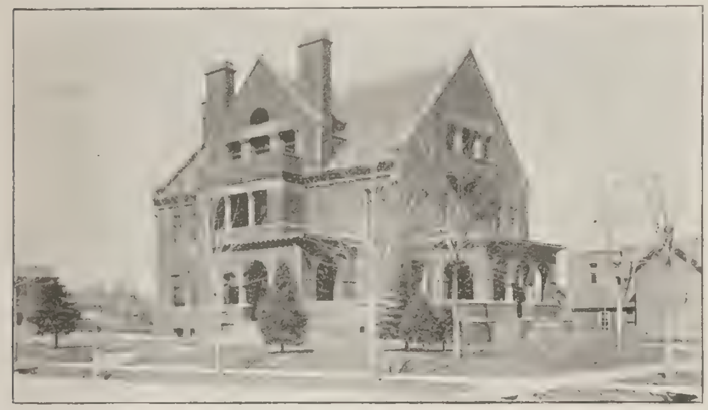
With a few exceptions, the best examples of brick architecture in Denver are to be found in the residence portions of the city, although the most expensive residences are of stone. Being obliged to design their houses for brick construction, the architects of Denver have had to rely almost entirely upon their own ingenuity (the city house as found in Eastern cities not being known here), and the result has not been bad. Ugly houses undoubtedly predominate, as I think may safely be said of all American cities, especially of the newer ones, in which the softening effects of time have not yet had a chance to tone down the defects. There is too much of a tendency in Western people to overdeck their houses, for the sake of making them showy, and it is sometimes a difficult task for the architect to satisfy his client, without putting in more features than he would like. Nevertheless, there is a good proportion of unobjectionable houses, and a few examples of really good brick residences.

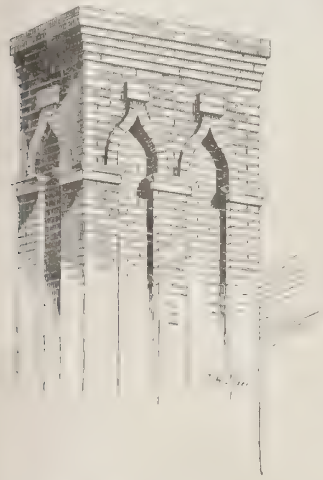
During our long summers, almost entirely free from rain, and our delightfully cool evenings, without dew or dampness, the residents spend a large portion of their time on their porches, so that a porch of some kind is an almost indispensable adjunct to every residence. Thus far, most of these porches have been built of wood, and the eaves and gables are also generally of wood, merely the walls of the building being of brick. It is very difficult to design a wooden porch that wlll look well against a brick house, as it almost always has a "stuck on" effect; but for moderate-priced houses there does not seem to be anything else to do. Most of the brick porches that have been built are not porches in the true sense of the word, but are recesses, or loggias, in the first story.



RESIDENCE OF DR. CHARLES DENNISON, DENVER, COL. A. C. SCHWEINFURTH, ARCHITECT.

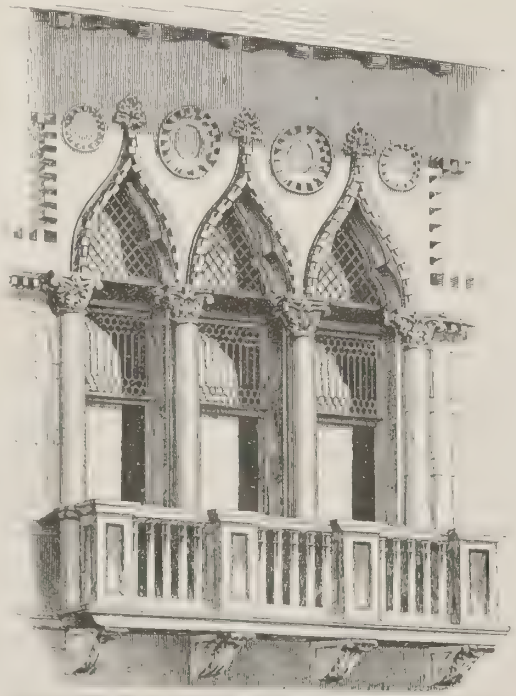
One of the best examples of an entirely brick house is the residence of Dr. Lemon, designed by Mr. A. C. Schweinfurth some four years ago. As may be seen from the photograph, the design is in the Romanesque style, and may be by some considered too heavy for a residence; but the mass is very good, and the house is generally liked. The porches are the distinguishing features of the design. The brick are a very dark red, and the trimmings are of a dark chocolate stone. The detail of the porch caps is excellent, and thoroughly in keeping with the design.





Another brick residence by the same architect is that of Dr. Charles Dennison (see photograph on preceding page), which is built of pink-colored brick, with stone trimmings of almost exactly the same shade, and marked like marble. This house is generally considered by architects, I think, as the handsomest brick house in the city. The design is Venetian, with Romanesque carving. The recess and balcony in the front of the second story are of stone, and very artistically detailed.

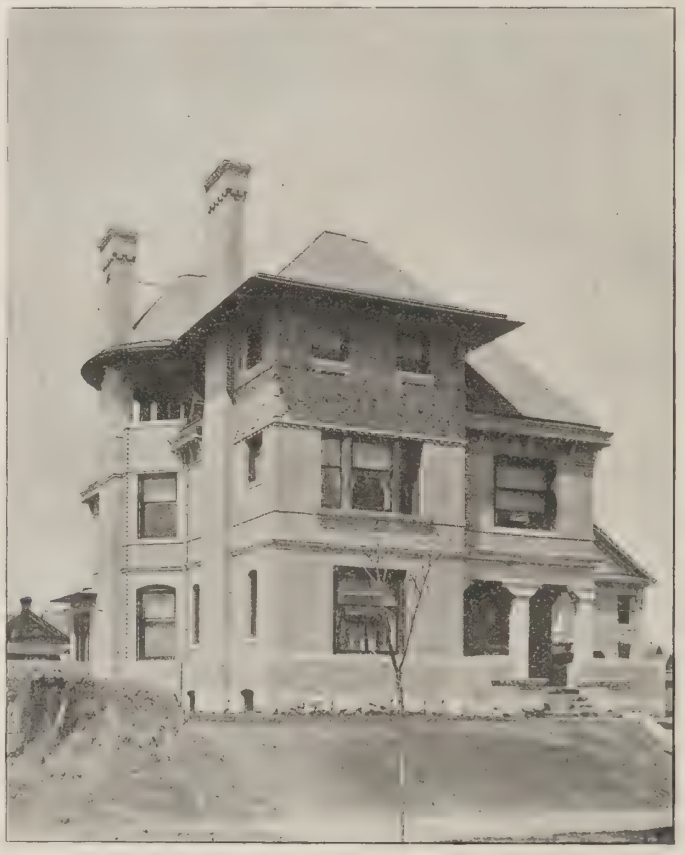
On the sides the trimmings are of brick, the detail shown in the sketch of the chimney being carried around the windows. The porch in this house, as will be seen, is in the form of a loggia, in the northeast corner of the first story.



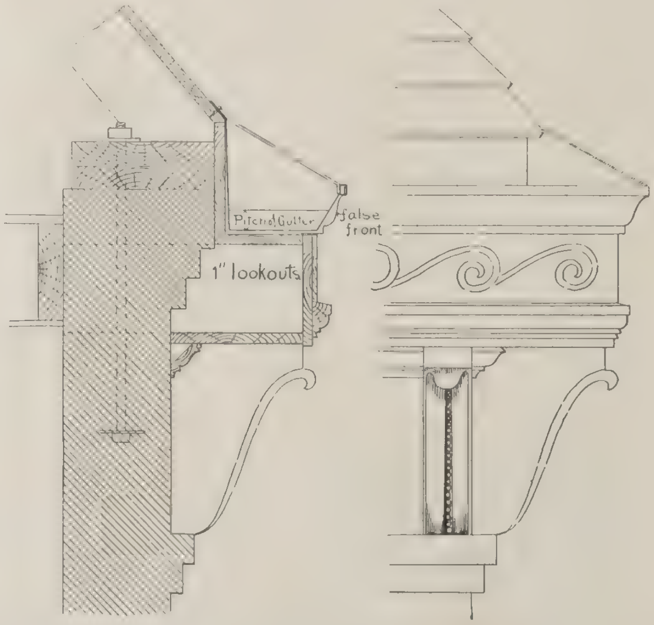
CHIMNEY-TOP AND BALCONY ON HOUSE OF DR. CHARLES DENNISON.

An entirely different design from either of these is shown in the photograph of a house on Pennsylvania Avenue by Mr. F. E. Kidder, which is built of a cream-colored brick with white stone trimmings. The stone is only used for sills and for the posts and lintel of the porch, the other details being of brick.

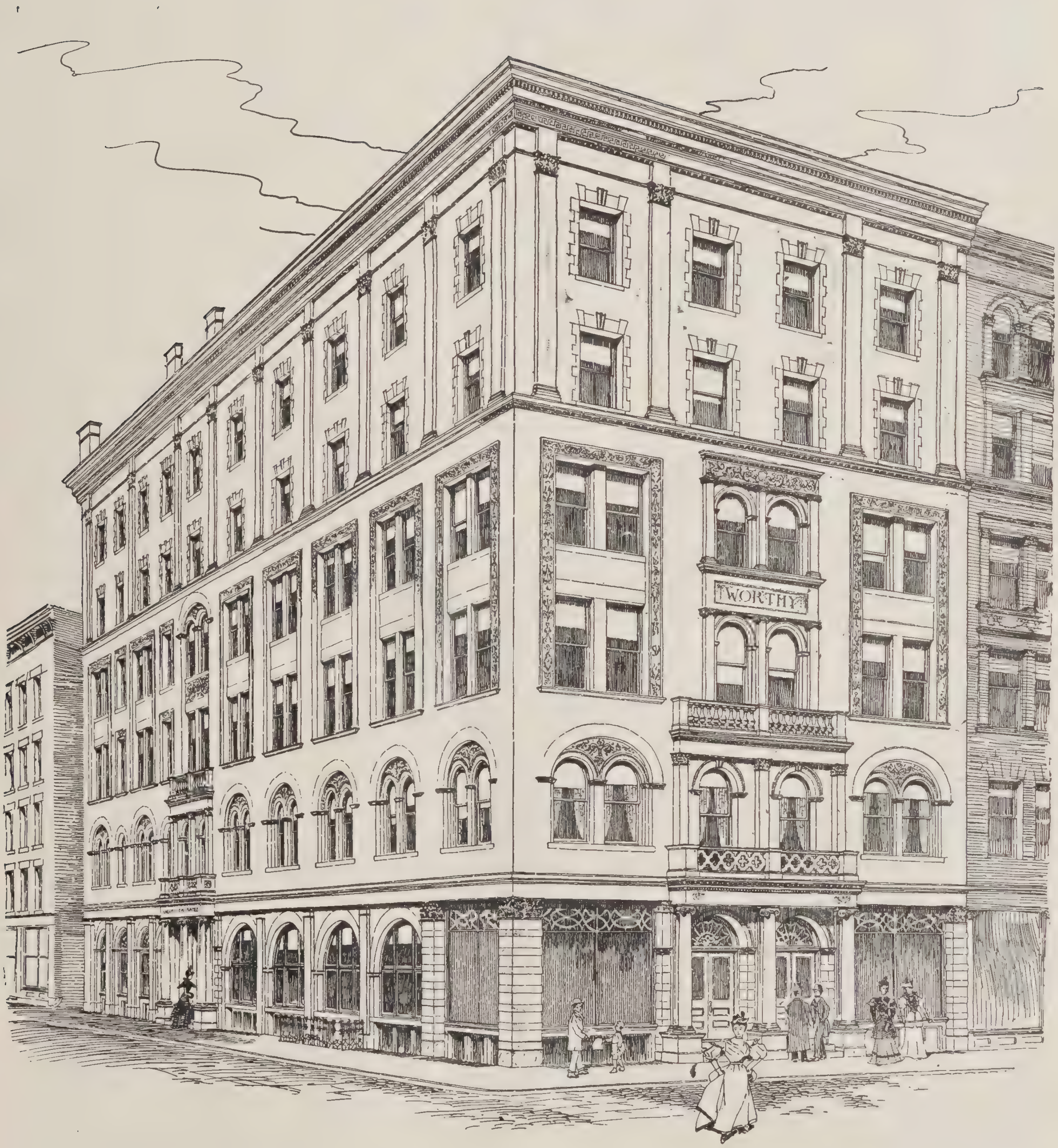
This house was built two years ago, and is the first example of diaper pattern in brick in the city, although it has since been introduced in several residences. The brick forming the pattern project about one fourth-inch from the wall, and are of a slightly darker shade than the ground. The roof of the tower or third story does not connect with the loggia roof on the side, as might be supposed from the photograph, but is separated from it by about six feet of roof. A detail is given of the main cornice, which should have been of terra-cotta, but the architect was obliged to construct it of wood, which is painted to match the stone work. The house is constructed of plain eight-inch brick, no moulded brick being employed.



HOUSE ON PENNSYLVANIA AVENUE, DENVER.
F. E. KIDDER, ARCHITECT.



One of the disadvantages under which the Denver architects labor is the lack of moulded brick of artistic designs. But very few shapes of moulded brick are carried in stock by the Denver manufacturers, and not more than half of these are desirable patterns. Special patterns can be made to order, but this requires more time

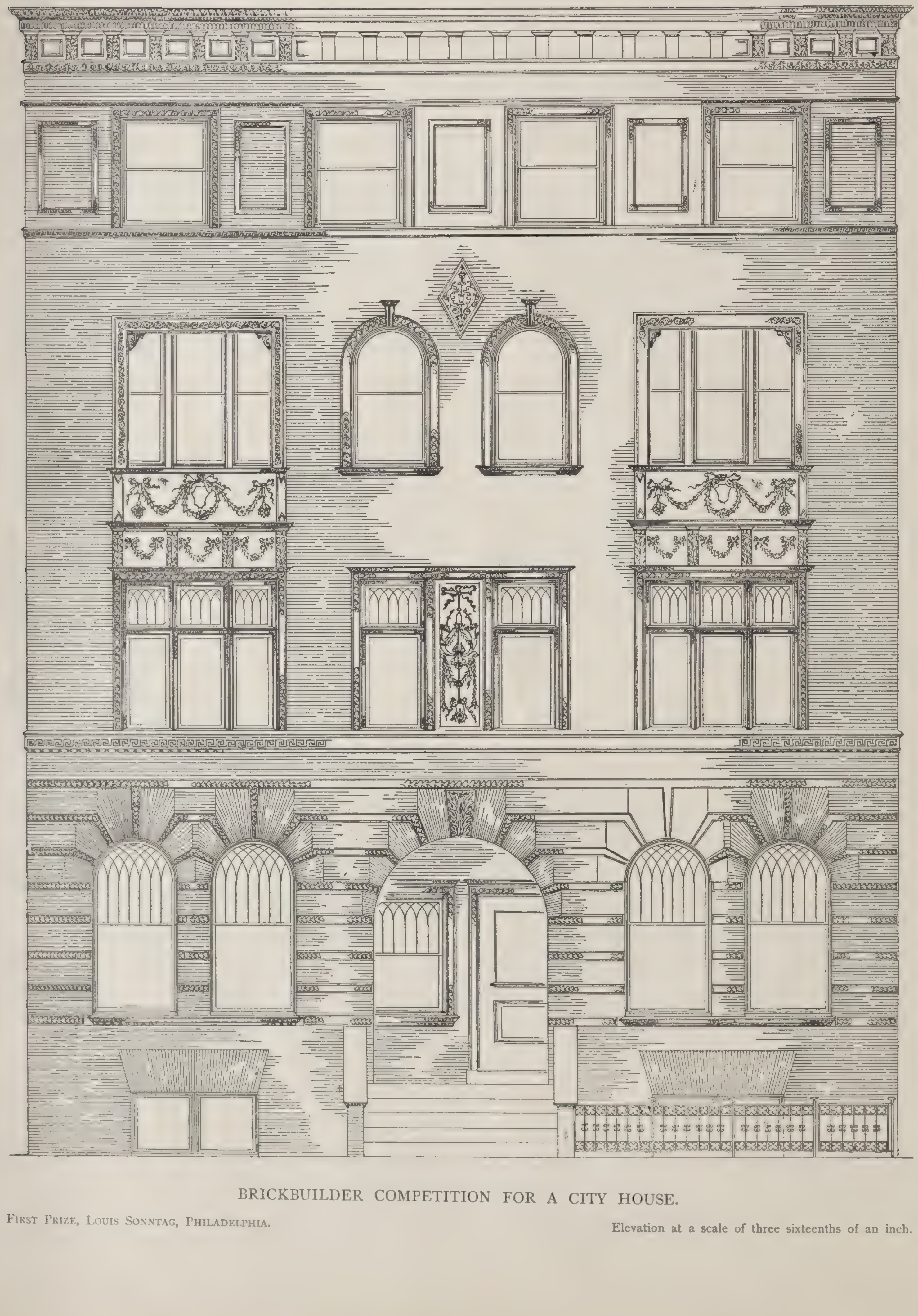


WORTHY BUILDING, MAIN AND WORTHINGTON STREETS, SPRINGFIELD, MASS.

GARDNER, PYNE & GARDNER, ARCHITECTS, SPRINGFIELD.

Front Brick by Eastern Hydraulic-Press Brick Co., Philadelphia.

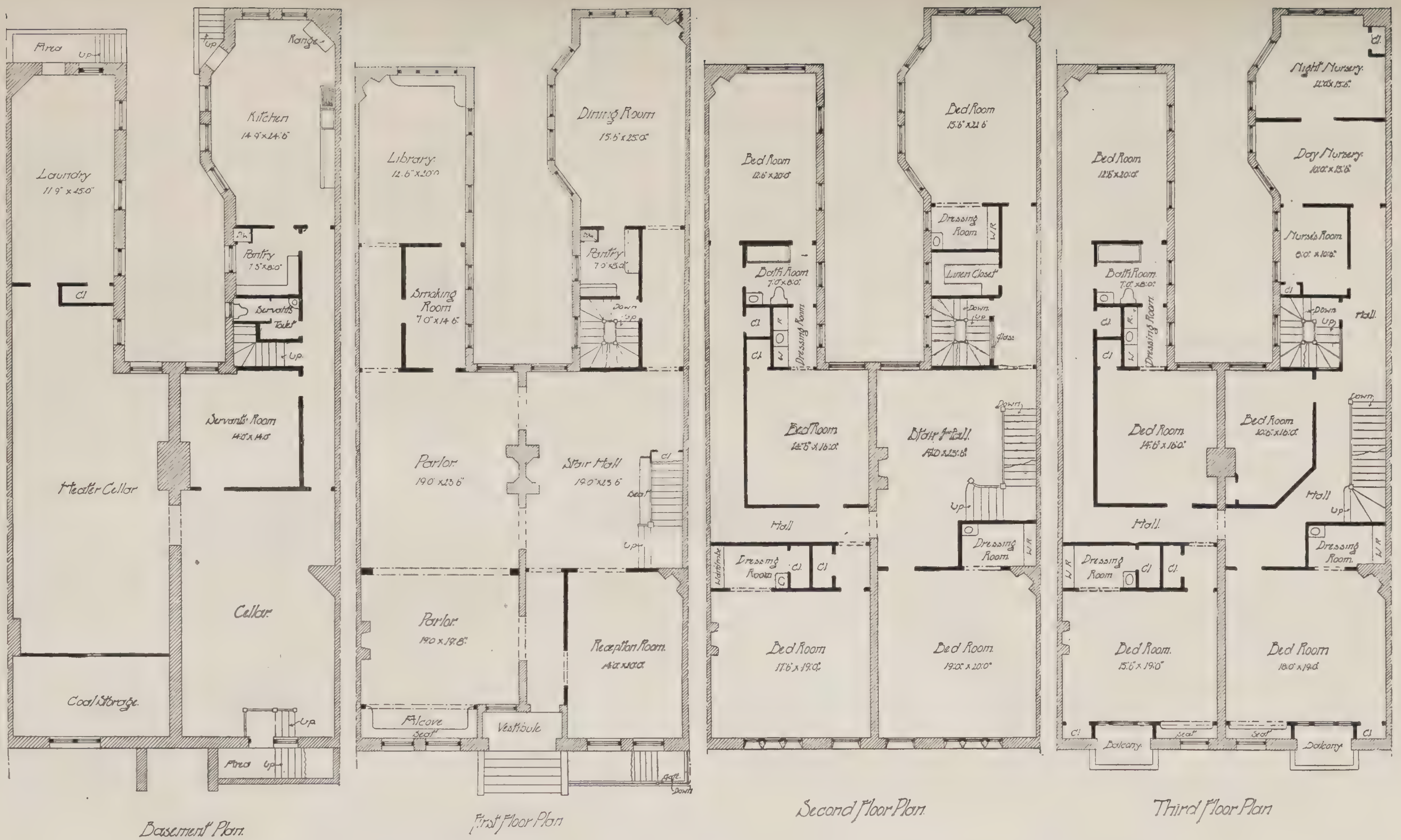
Terra-Cotta and Porous Terra-Cotta Fireproofing by Fiske, Homes & Co., Boston.



BRICKBUILDER COMPETITION FOR A CITY HOUSE.

FIRST PRIZE, LOUIS SONNTAG, PHILADELPHIA.

Elevation at a scale of three sixteenths of an inch.



BRICKBUILDER COMPETITION FOR A CITY HOUSE.

First Prize, Louis Sonntag, Philadelphia.

Plans at a scale of one sixteenth of an inch.

The general shape of the plan was adopted as giving direct and better light in every room than could be obtained in any other way that occurred. It is not thought that the light-well in position shown isolates the apartments in either wing in a way that will prove unhandy in any way. Large rooms are provided rather than a greater number of rooms of a smaller size. Dressing-rooms have been provided in connection with all the principal bedrooms wherever it was possible without cutting into the bedrooms and reducing their size. In a house of this size they are found to be a great convenience. The hall in the upper stories of the parlor side of the house is intended to be lighted by transoms over the doors opening into it, and by sash placed high up in the central bedroom partition. The outside vestibule was adopted, as it was thought that there could be no serious objection to the vestibule in common between the two houses, and it allowed of the placing of a central opening in the elevation, which tends to make the house keep its indentity as one house, and yet not look wrong as two houses when altered with two doors in vestibule. The central brick wall was embodied, as the introduction of a party wall, in the event of alteration, would be rather an expensive alteration. As few openings as are possible were put in same, and they are intended to be arched over and finished square.

The front is intended to be faced with two shades of Pompeiian brick, Roman size, the darker shade to be used up to the second-story sill line, and the lighter shade for everything above. The terra-cotta to match the bricks where it occurs. The cornice is intended to have about three feet projection.

Height of Floors. — Basement, 9 feet; 1st floor, 12 feet; 2d floor, 11 feet; 3d floor, 10 feet; and 4th floor, 9 feet 6 inches.

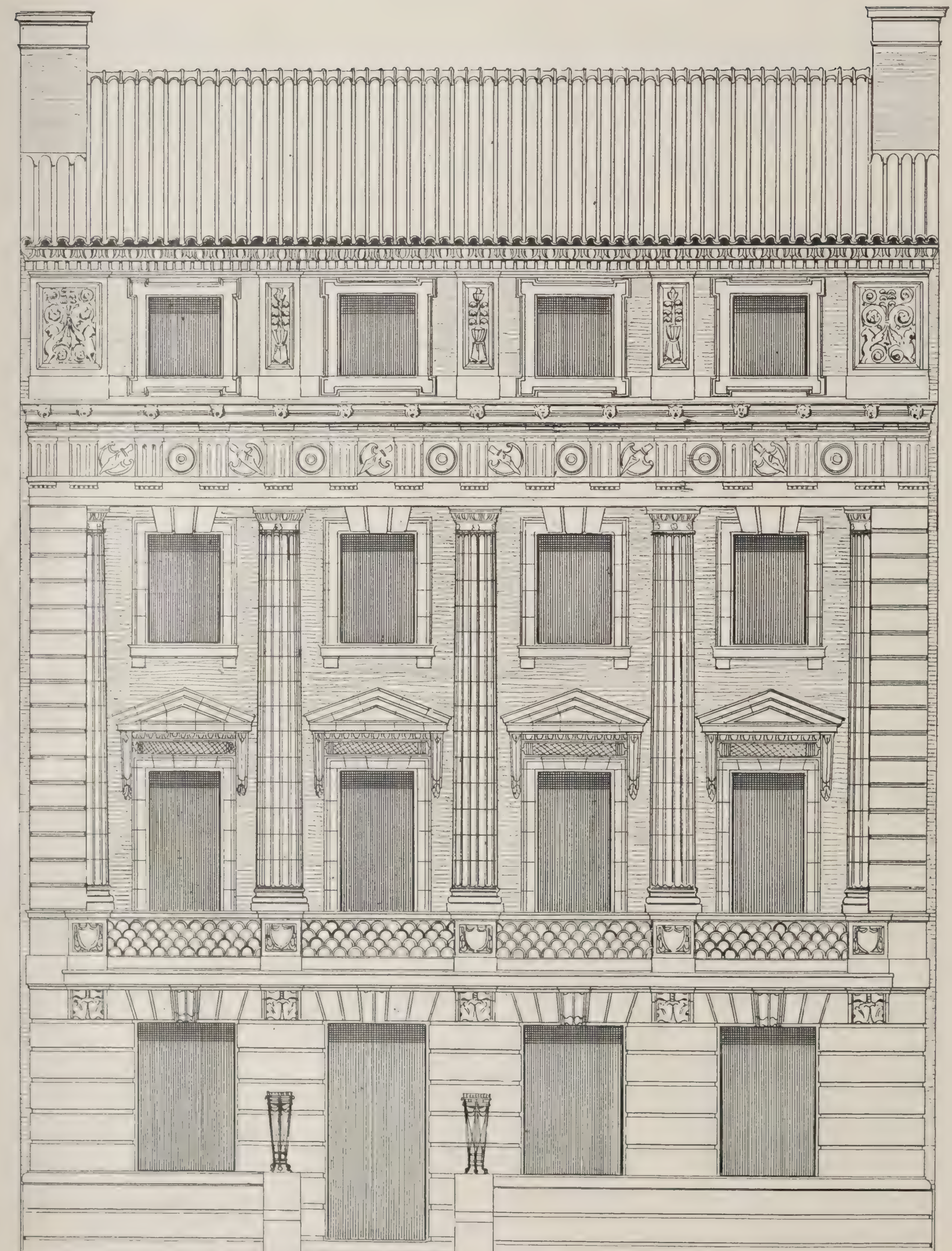
The following alterations would make two houses complete in all particulars: —

Partitions to be added or altered and stair built to make the parlor side of the house the duplicate of the present stair side hall, reception-room, and entrance hall, and a pantry and rear stairs could be built in the space now occupied by the smoking-room. The library changed to a dining-room. The stair hall side of the house would be complete as one house when the openings in the central brick wall were closed up, with the exception of a bath-room which could be placed in the space now occupied by the linen-closet and dressing-room, adjoining on the second floor. The vestibule in front of the house could be divided by a light iron railing, and the window cut down and made a front entrance door.

In the upper stories the introduction of the main stairway in parlor side of the house would alter the shape of the central bedrooms in the second and third floors to that of the one over the present stair hall in second story. The rear stairway would take the space now occupied by the dressing-room and closets to the central bedroom in second and third stories. The second story rear bedrooms would probably be taken for a sitting-room in each side of the house.

The billiard-room in the fourth floor need not be disturbed unless the space is needed for bedrooms; and the play-room and storeroom altered to make a bath-room and bedrooms for servants.

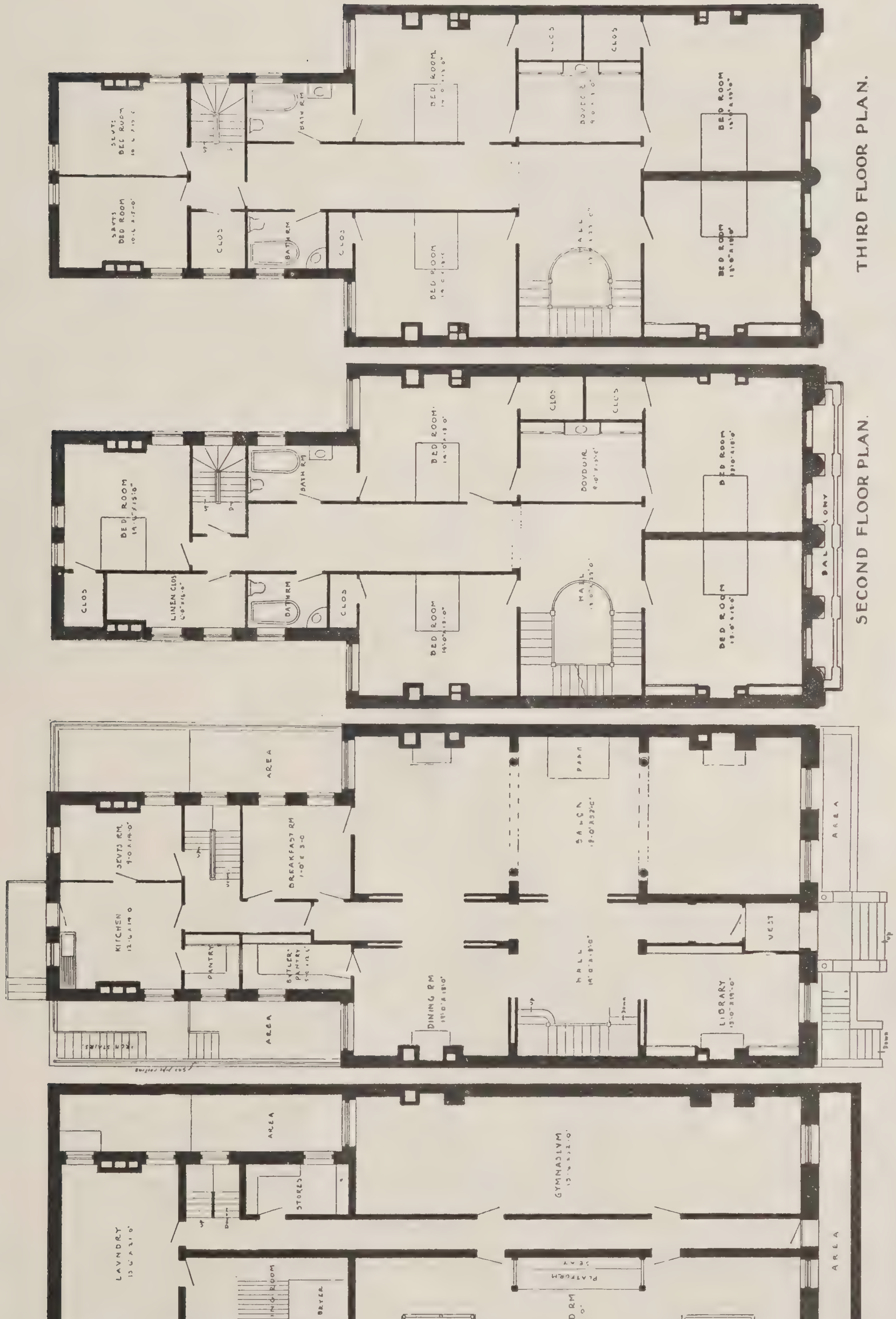
In the basement the laundry would be turned into a kitchen, and laundry taken out of cellar space. Access to cellar from front street, if needed, could be arranged as shown on other side of house.



BRICKBUILDER COMPETITION FOR A CITY HOUSE.

SECOND PRIZE, JAMES C. GREEN, ST. LOUIS, MO.

Elevation at a scale of three sixteenths of an inch.



THIRD FLOOR PLAN.

SECOND FLOOR PLAN.

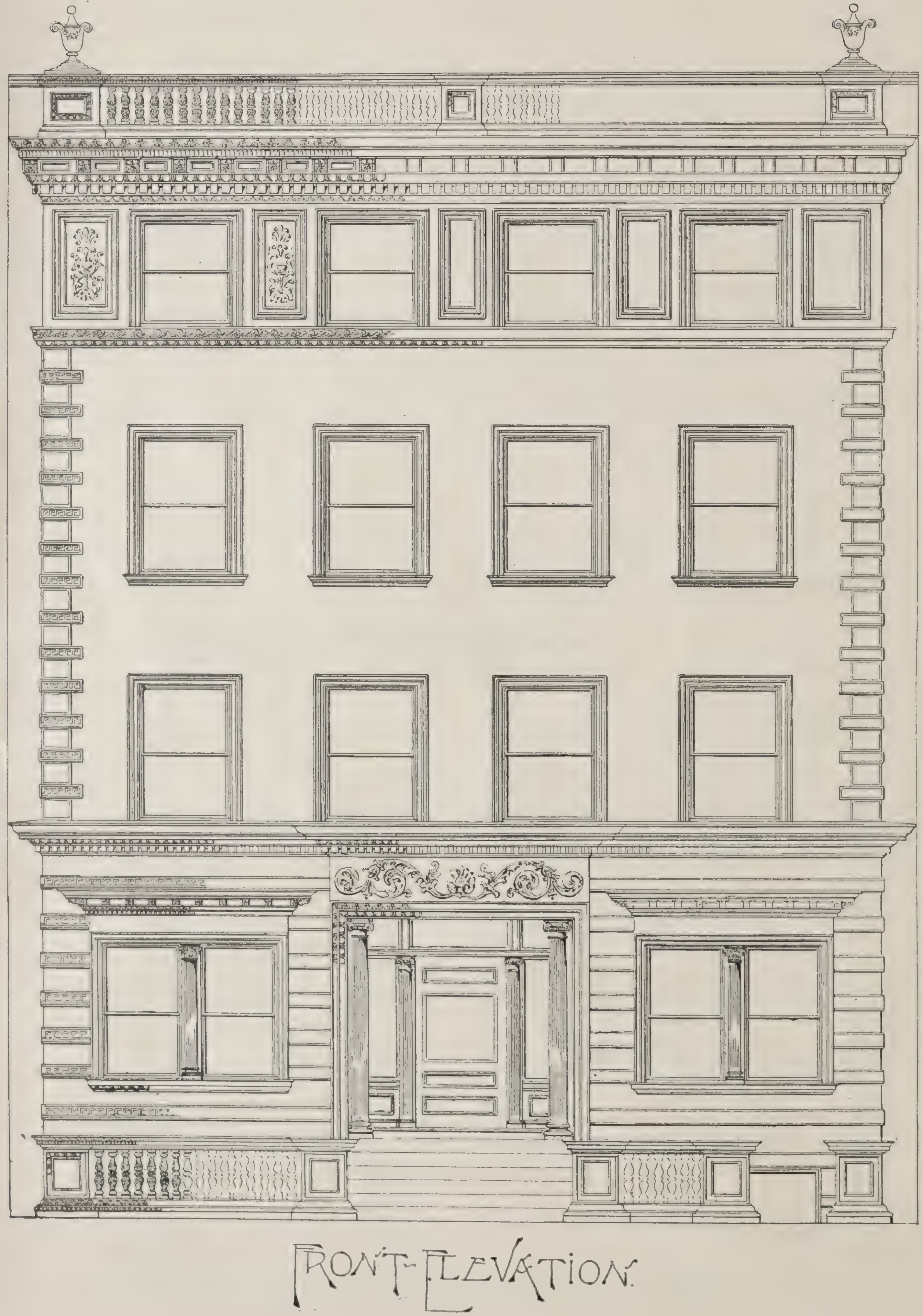
FIRST FLOOR PLAN.

BASEMENT PLAN.

BRICKBUILDER COMPETITION FOR A CITY HOUSE.

Second Prize, James C. Green, St. Louis, Mo.

Plans at a scale of one sixteenth of an inch.



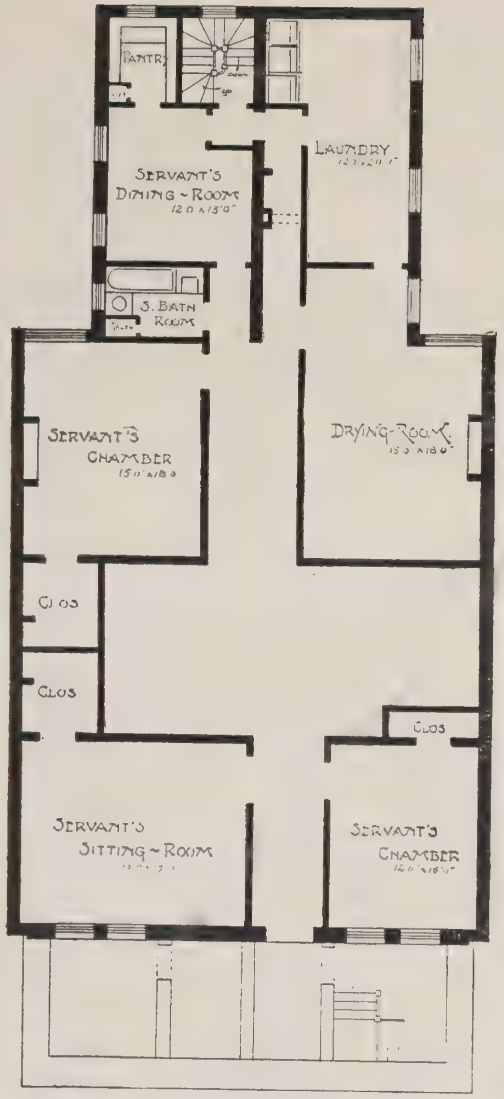
FRONT-ELEVATION.

BRICKBUILDER COMPETITION FOR A CITY HOUSE

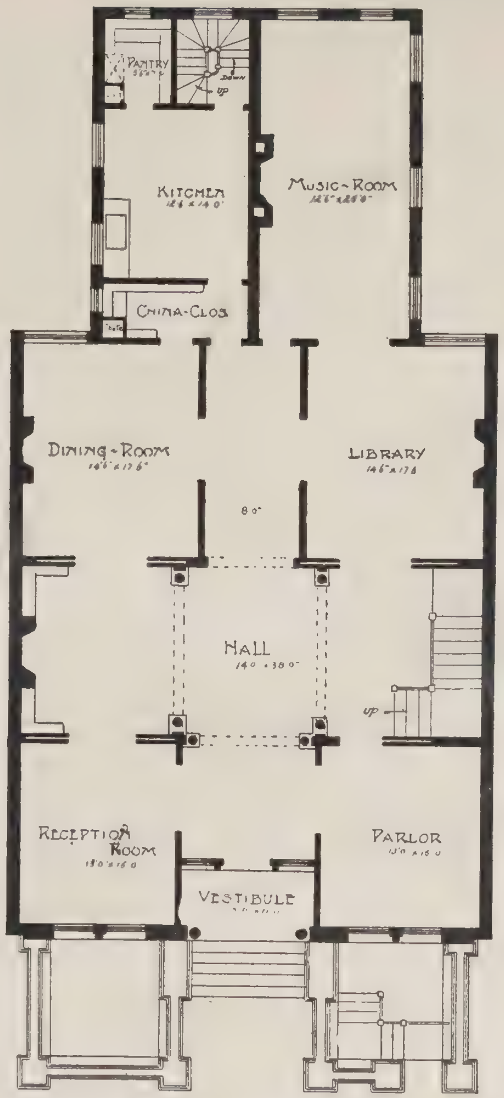
THIRD PRIZE, E. S. WESTER, BOSTON.

Elevation at a scale of three sixteenths of an inch.

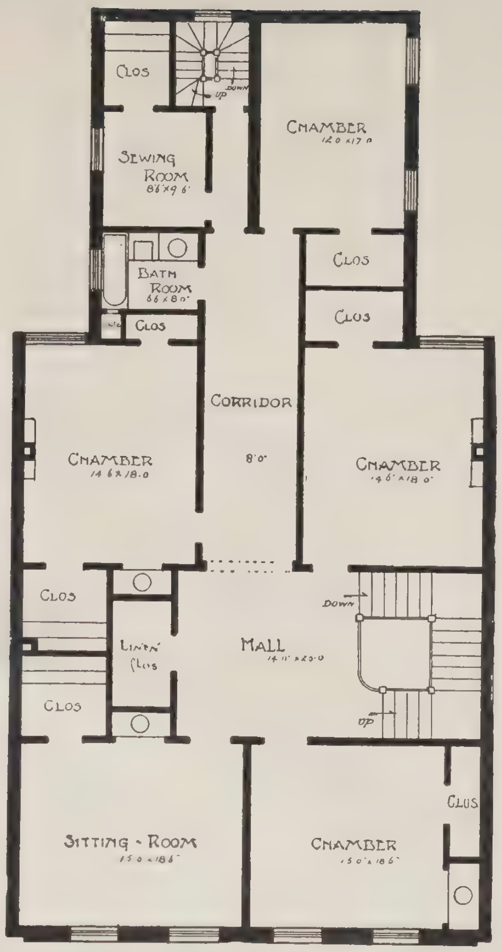
BASEMENT - PLAN


PANTRY
LAUNDRY
SERVANT'S DINING - ROOM 12.0 x 13.0
S. BATH ROOM
SERVANT'S CHAMBER 15.0 x 18.0
DRYING - ROOM 15.0 x 18.0
CLOS
CLOS
CLOS
SERVANT'S SITTING - ROOM
SERVANT'S CHAMBER

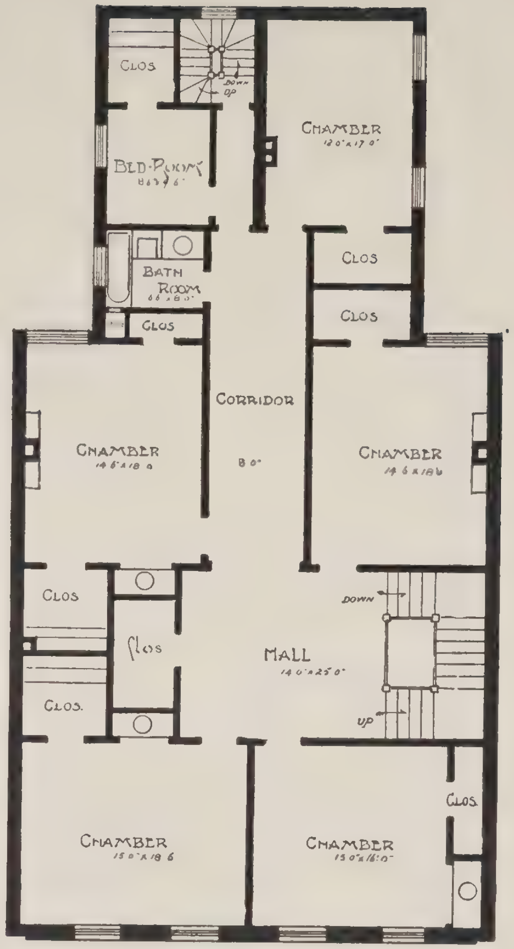
BASEMENT - PLAN



FIRST - FLOOR - PLAN



SECOND - FLOOR - PLAN



THIRD - FLOOR - PLAN

BRICKBUILDER COMPETITION FOR A CITY HOUSE.

THIRD PRIZE, E. S. WESTER, BOSTON.

Plans at a scale of one sixteenth of an inch.

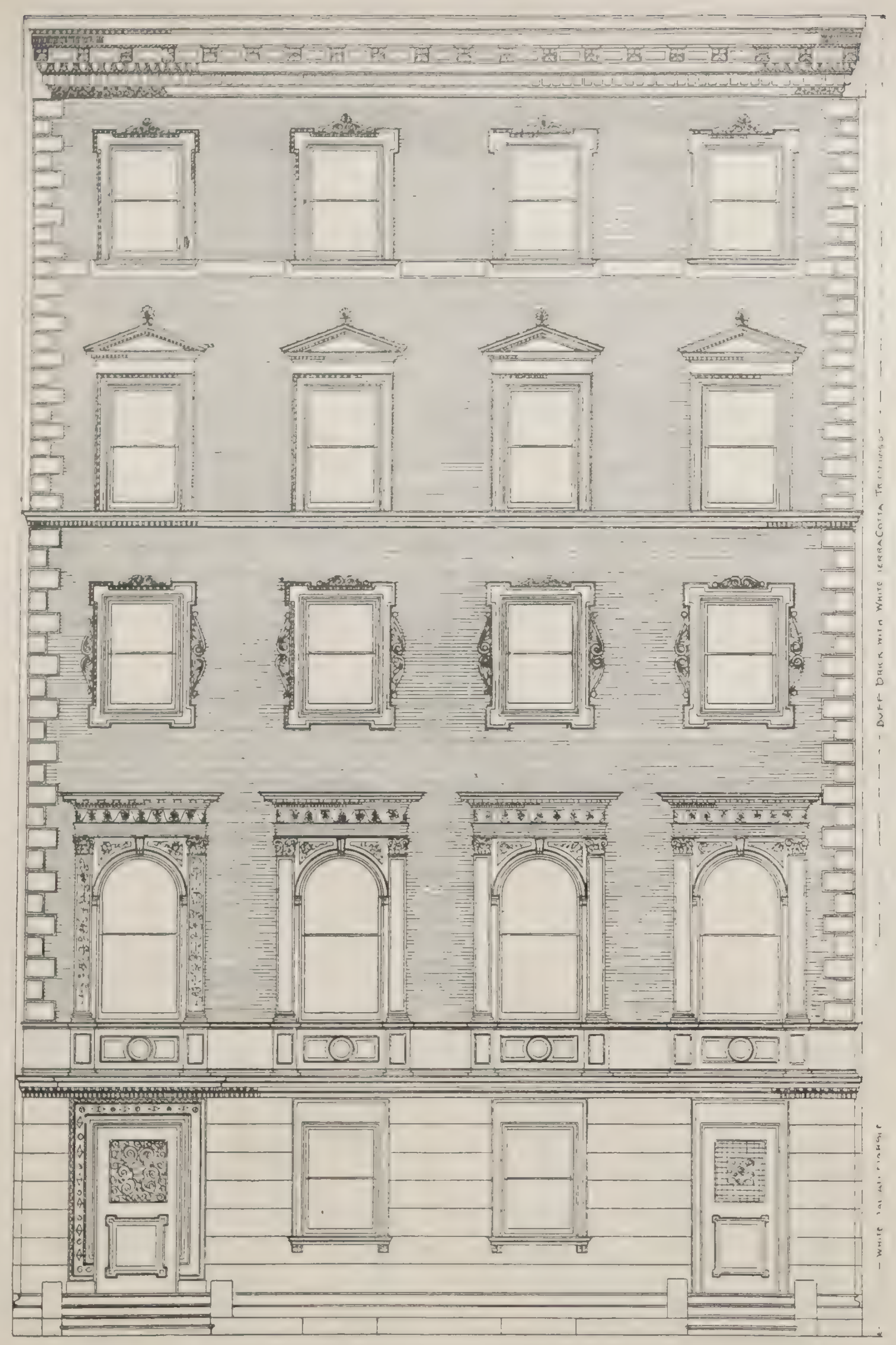
PLANS.—In the cellar the party wall would be carried the whole length of the house, and up to the basement floor, so that it would only be necessary to build from that floor to roof, with the exception of the wall that shows on present plan.

Basement.—For a double house make the servants' dining-room the laundry, leaving the chamber and bathroom the same. A few feet would have to be taken off of the sitting-room for passage to the area, changing the sitting-room to a chamber.

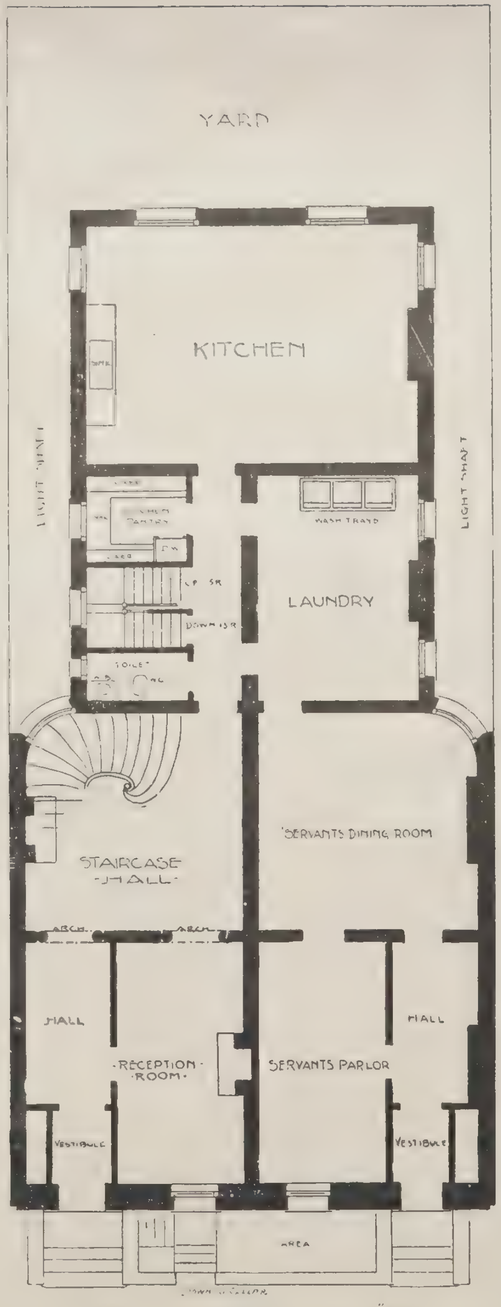
First Floor.—Besides the party wall there would simply be a few partitions to put in music-room, same as on opposite side of house. In the front hall the fireplace would have to be taken out and replaced by front stairs. This would give a kitchen, dining-room, reception hall, and parlor in each house. For the front entrance run the party wall as far as vestibule and from there out to be a panelled partition which would end into a column placed between the columns that are now on plans.

Second, Third, and Fourth Floors.—On these floors it would only be the putting in of bathroom, back and front stairs. The front chambers of second floor change into sitting-rooms. On the fourth floor, by carrying the front hall through, would make both front rooms same size as present chamber. These make into billiard-rooms by taking away closets and wash bowls.

Front.—For the front have first story of terra-cotta, and from belt under fourth-story windows up to be of same. The intermediate stories fill in with common brick (except columns and architraves, which would be of terra-cotta) laid in white mortar, Flemish bond. To give the appearance of a double house run a balustrade in the centre of present entrance with a post on the end, to be same as the one around areas. By putting a column in the centre of present entrance and running a panelled partition back to the party wall, which would make the two required entrances.

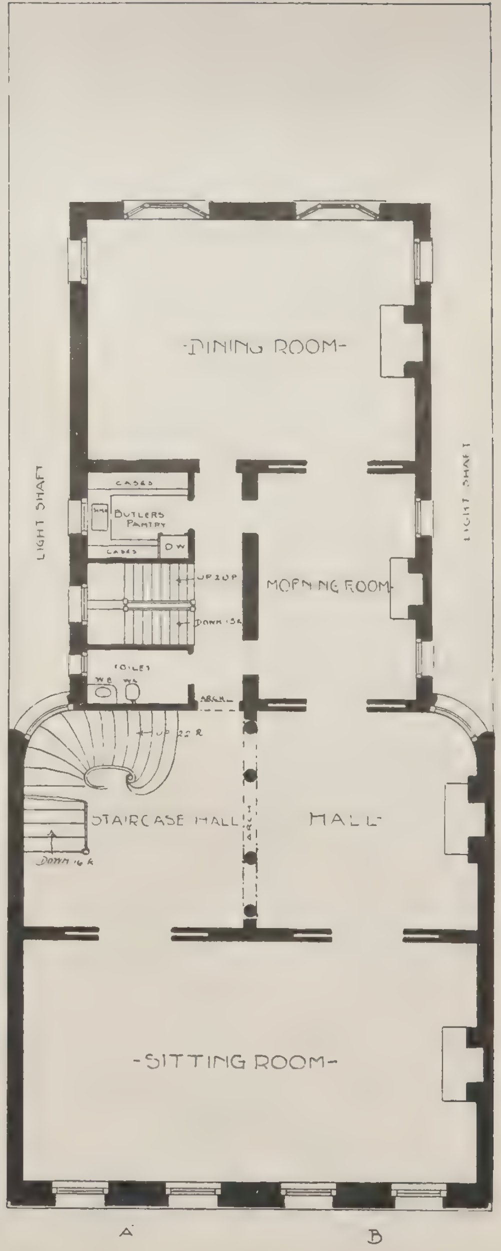


Elevation at one eighth inch scale.



-BASEMENT- 3

SCALE, 8 FT = 1 INCH



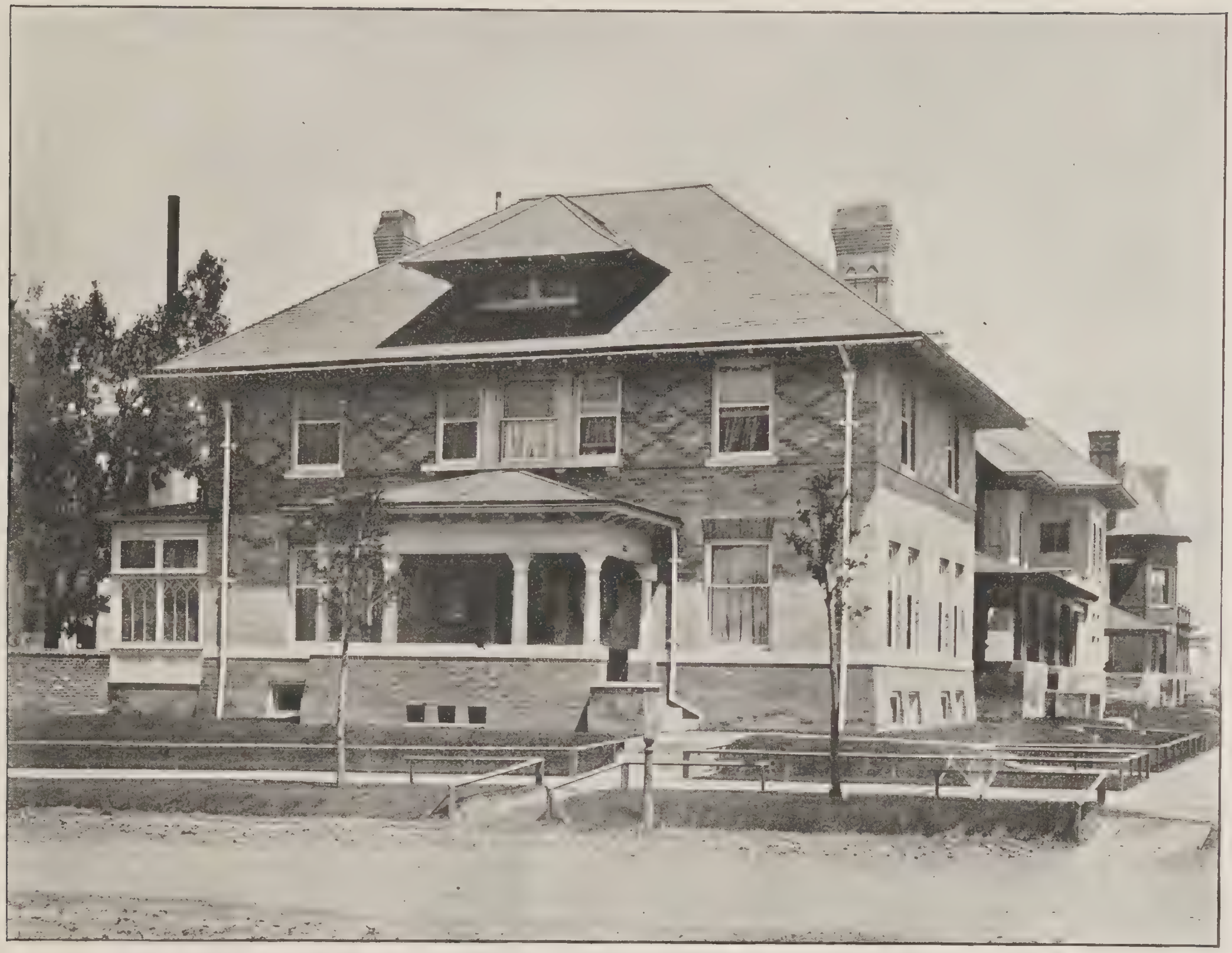
FIRST FLOOR

Plans at one sixteenth inch scale.

For additional plans and description of changes see page 132.

BRICKBUILDER COMPETITION FOR A CITY HOUSE.

FOURTH PRIZE, GILBERT F. CRUMP, ROCHESTER, N. Y.



RESIDENCE ON FRANKLIN STREET, DENVER. J. G. LINK, ARCHITECT.

than can usually be given, and, unless a large number of an especial pattern is wanted, the cost is prohibitory. In none of the buildings illustrated in this article are moulded bricks used.

One of the best examples to be found in the city of a low-cost brick residence is the Franklin Street house, shown by a photograph, which was designed by Mr. J. G. Link. This house probably cost about four thousand dollars; it is built of a pinkish-colored brick, with very light-pink stone trimmings. The diaper is picked out by brick of a darker shade, which are set flush with the wall. The roof is shingled, and stained a moss green.

As may be judged from the illustrations that have been given, the present prevailing style of cornice for residences is that of the overhanging eaves, with sawed rafter ends, the projection varying from three to four feet.

There are a few examples of colonial residences, but these have mostly wooden trimmings and details, and only differ from wooden houses in having brick walls instead of frame. In many of these houses the brick has been painted yellow, so that the effect at a distance is about the same as that of a wooden house.

Although this is not generally considered proper treatment for a brick building, these houses form an agreeable contrast to the mass of red brick buildings, and, as the architects could not build of wood, they did the only thing possible, considering the limit of cost, to obtain the desired effect; and, after all, a painted brick wall is much drier and more enduring than one not painted. Probably a large proportion of the brick buildings built before pressed brick were obtainable will be treated in this way before many years.

At present there are only about half a dozen houses being erected, and there are very few on the boards, owing to the general business depression which has greatly affected building operations, so that the architects here have been practically idle for nearly a year.

With the revival of building, for it is to be hoped that it will revive, the Renaissance will probably be the prevailing style as far as it can be followed with the materials at hand. There has been a tendency within the past year to use cement and *carton-pierre* for panels and ornaments, following the example of the World's Fair buildings. In the few buidings in which these materials have been used, they have withstood the action of the weather satisfactorily, and they appear to be well suited to our climate. An example of this class of work will be given in another communication.

E.

THE WORTHY BUILDING, SPRINGFIELD, MASS.

MESSRS. GARDNER, PYNE & GARDNER are the architects of this building (see Plate 49), which stands on the corner of Main and Worthington Streets, having a frontage of 48 feet on the former and 139 feet on the latter. It will be used for hotel purposes, and is fireproofed throughout with material made by the Staten Island Terra-Cotta Lumber Co., supplied through Fiske, Homes & Co. of Boston, who also furnish the outside terra-cotta for window trimmings and belt courses, in a medium shade of their fire-flashed line of terracotta. The exterior walls are of Eastern Hydraulic Press Brick, shade number 210. Brownstone and Milford granite are used for the stone work. This building replaces the hotel destroyed by fire last fall, and the proprietor, Mr. Worthy, has taken every care that his new hotel will be absolutely safe.

THE BRICKBUILDER COMPETITION FOR A CITY HOUSE.

ALL of the plates of this number, with one exception, are devoted to the first four prize designs in this competition. A brief statement of the programme, which was published in full in the April number, will serve to make the plates clearer.

It was supposed that the owner of a forty-foot city lot in New York City wished to build a fine residence so planned and designed that should he ever wish to sell the property it could be made into two twenty-foot houses by a few comparatively small alterations, thus enabling him to make a readier sale and realize a larger price.

The designs, twenty-six in number, were submitted to a jury consisting of Messrs. Robert D. Andrews, George H. Wetherell, and Herbert Jacques, who selected the designs here published, as the four best. In a later number we will publish the fifth and sixth prize designs, by Edwin R. Clark of Lowell, Mass., and J. Mills Platt of Rochester, N. Y. Below we give the explanatory notes accompanying the fourth design by Gilbert F. Crump of Rochester, N. Y.; and also publish on this page his second and third floor plans.

List of alterations in the plans of design marked "Capital" in order to make two houses twenty feet wide: —

Cellar. Adapt plan "A" to plan "B" in every respect. Place one of the two heaters of plan "B" in storeroom of plan "A," and close opening in party wall.

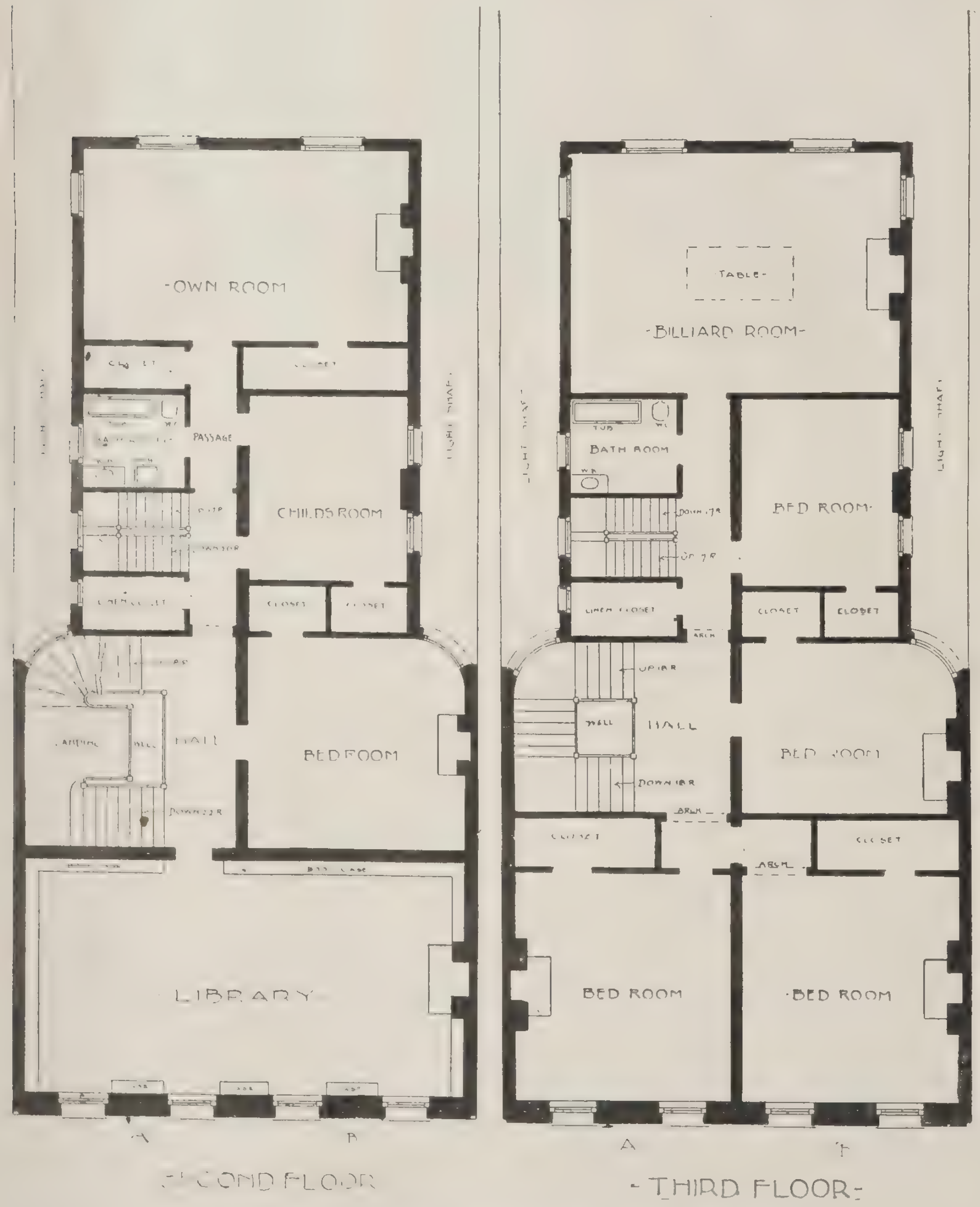
Basement. Adapt plan "A" to plan "B" in every respect, removing laundry tubs to kitchen. Build up party wall in kitchen and close all openings in same.

First floor. Build party wall through hall, sitting and dining rooms; close up opening in same. Adapt plan "A" to plan "B" in regards stairs, butler's pantry, and toilet-room. Build fireplaces in dining and sitting rooms.

Second floor. Build party wall through library and own rooms, and close all openings in same; then adapt plan "A" to plan "B." Build fireplace in library and own rooms.

Third floor. Build party wall through billiard-room and close openings in same. Adapt plan "A" to plan "B," and build fireplace in billiard-room.

Fourth floor. Close up openings in party wall; then adapt plan "A" to plan "B."



FOURTH PRIZE DESIGN, COMPETITION FOR CITY HOUSE.

For elevation and other plans see Plate 56.

A GEM FROM RUSKIN.

AND here let me pause for a moment to note what one should have thought was well enough known in England, — yet I could not, perhaps, touch upon anything less considered, — the real use of brick. Our fields of good clay were never given us to be made into oblong morsels of one size. They were given us that we might play with them, and that men who could not handle a chisel might knead out of them some expression of human thought. In the ancient architecture of the clay districts of Italy, every possible adaptation of the material is found exemplified; from the coarsest and most brittle kinds, used in the mass of the structure, to brick for arches and plinths, cast in the most perfect curves, and of almost every size, strength, and hardness; and moulded bricks, wrought into flower-work and tracery as fine as raised patterns upon china. And, just as many of the finest works of the Italian sculptors were executed in porcelain, many of the best thoughts of their architects are expressed in brick, or in the softer material of terra-cotta; and if this were so in Italy, where there is not one city from whose towers we may not descry the blue outline of Alp or Apennine, everlasting quarries of granite or marble, how much more ought it to be so among the fields of England! I believe that the best academy for her architects, for some half-century to come, would be the brick-field; for of this they may rest assured, that till they know how to use clay, they will never know how to use marble. — *Stones of Venice.*

FOR some time we have refrained from publishing, as has been our wont, the letters received from subscribers complimenting our publication. We could, however, publish a neat little volume made up of such.

The fact that in the six months ending July 1 our paid subscriptions have more than doubled is quite in evidence that our efforts are appreciated.

THE BRICKBUILDER.

AN ILLUSTRATED MONTHLY DEVOTED TO THE ADVANCEMENT OF ARCHITECTURE IN MATERIALS OF CLAY.

PUBLISHED BY

The Brickbuilder Publishing Company,

CUSHING BUILDING, 85 WATER STREET, BOSTON.

P. O. BOX, 3282.

Subscription price, mailed flat to subscribers in the United States and Canada	$2.50 per year
Single numbers	25 cents
To countries in the Postal Union	$3.00 per year

COPYRIGHT, 1893, BY THE BRICKBUILDER PUBLISHING COMPANY.

Entered at the Boston, Mass., Post Office as Second Class Mail Matter, March 12, 1892.

THE BRICKBUILDER is for sale by all Newsdealers in the United States and Canada. Trade Supplied by the American News Co. and its branches.

PUBLISHERS' STATEMENT.

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FEW architects realize what a difference in cost intelligence in terra-cotta designing makes. Here our habit of designing on paper shows one of its weakest points. Draughtsmen make pretty drawings of the various accepted ornamental motives, judging the design by the lines before them, forgetting that the drawing is only a tool used in the execution of the work. As such it must be made with the most thorough knowledge of the material to be used and the methods of working it. Every material has certain limitations. To go beyond these involves extra expense in working, and produces an unnatural result that at once forces itself upon the attention of one intimate with the material.

The question of cost is an important one, and will demand consideration where objections on an æsthetic score are unheeded. In terra-cotta work a designer, knowing the character of his material, will produce at considerably lower cost results that are vastly more effective than those of a designer who knows materials only as they are indicated by a wash, or labelled, on the paper before him.

He knows how the pieces will be modelled, how joined, and in what shape they stand least in danger of warping while burning. He governs his detailing by these characteristics, and the manufacturer has a straightforward, intelligent piece of work to figure on. He knows exactly where he will come out; his factor of uncertainty is a proportionately small one.

Take, on the other hand, a design which absolutely ignores the character of the material, and involves in its execution a large element of risk. This risk is a factor in the estimate, and is often so large as to add thousands of dollars to what the cost should be for practically the same work intelligently designed. Any practical terra-cotta maker can give the average architects points on terra-cotta designing that will save his clients money, and enable him to make his work proportionately more effective. There are few manufacturers who would not gladly devote time to showing an architect those details of manufacture which had a bearing upon the designing of terra-cötta work. We have made arrangements for some articles upon the detailing of terra-cotta work, but their value will be insignificant as compared with a few hours at some well-managed factory in company with a man who knows the practical part of the business.

INSTANCES have recently come to our attention which would seem to give material-men considerable ground for complaint against some architects for decidedly unfair treatment. We cannot see the justice of allowing manufacturers to figure on work and put in bids, which, on their part, is done in all earnestness, when the architect has made up his mind not to give them the contract if they are the successful bidder. One of the most aggravating and yet most common instances of dishonorable practice is that of allowing several manufacturers to estimate with a view to using the lowest estimates to beat down one of the bidders whom the architect wants to have do the work, yet whose initial bid is apt to be above the average. It is usually done by taking the lowest bid to the selected bidder and telling him he can have the job if he will meet the successful bid. We say it is dishonorable because it is dishonest practice. The taking off of quantities and the figuring of costs is no little item in the time of the manufacturer or his agent. He invests this time as a part of his expenses in securing business. The architect who takes his time, having decided not to give him the contract, is a *thief*, for no material-man will estimate unless he thinks he will get the contract if his bid is the lowest. He certainly would not work hard for hours preparing an estimate which he knew would be used only to beat down a competitor.

The architect may give as his excuse that he was not satisfied that the lowest bidder could satisfactorily fill the contract. The only answer to this is that he should satisfy himself beforehand that none but responsible bidders were allowed to figure. It is a characteristic of the best offices that the figuring is not thrown open to Tom, Dick, and Harry, but to a list of reputable contractors and material-men. The architect who "turns down" the would-be bidders frankly, because he has doubts as to their satisfactorily carrying out the contract, is far more honorable and aboveboard than he who allows every one to figure because he dislikes to shut out certain ones.

THE manufacturing town of Hudson, Mass., has just had a conflagration that enables it to practically begin again. It was one of those towns of long and slow growth, containing many wooden structures. The business men have at once taken steps to rebuild, and have adopted the wise plan of acting together, sacrificing individual interests to those of the community. It is gratifying to us to note the no uncertain stand the business men have taken, almost to a unit, that the new buildings must be brick, and that frame structures will not be allowed within the limits of the business centre. Such buildings need not be fireproof in the sense that our steel skeleton hollow tile office buildings are fireproof. But with slightly increased expense, and with intelligent planning and construction, the new buildings of Hudson may be made so fire resisting as to burn slowly when they do catch fire, and to restrict the fire to the room it originates in long enough to allow the fire department to get to work. Wooden joists may be protected very efficiently by slabs of porous terra-cotta, or, as it is sometimes called, terra-cotta lumber, — a material which can be sawed and fitted like ordinary lumber, and securely nailed to the studding or joists it is to protect. Wire lathing gives a similar protection, and has shown by tests that it will hold a hot fire from a half to three quarters of an hour without giving way. Ordinary wood lathing almost immediately fails, and at the ceiling too, the plastering falling and exposing the joists to the fire beneath. There are numerous methods of construction that retard the progress of fire and yet cost but a little more than the most inflammable kind of construction. It seems to us that one of the first duties of the citizens of Hudson is the framing of a set of safe building laws, and the appointment of an able inspector to see that they are followed.

A CITY architect is a good thing for a city when a good man fills the place, but it is a dangerous office to create unless there is a tolerably fair certainty that plenty of good men will be available. Brilliant as has been Mr. Wheelwright's success as occupant of the office under Mayor Matthews, think of what that office was in the years leading up to his appointment, and think what it may be next year, when he retires. The patronage connected with the building operations of a large city is too strong a temptation to the average politician to be resisted. It needs the strongest kind of a man to keep the line drawn at anything in the nature of corrupt practices. We hear Milwaukee wants such an office, and the architects there are canvassing the pros and cons. If they want our advice it is brief, "*Don't.*"

FOLLOWING upon the recent labor disturbances in the West, the successful arbitration over a reduction of bricklayers' wages, between the Mason Builders' Association and Bricklayers' Union No. 3 of Boston, is a hopeful sign that in some portions of the country disagreement between employer and employee is coming down to a logical and civilized basis of settlement. Arbitration when used as "an ounce of prevention," as Secretary Sayward aptly puts it, fills its only proper place. If it is at all applicable, it certainly should come in as a preventive, and not as an adjuster of disagreements. In the case in question, the form prepared by the National Association of Builders was followed. This form recognizes two sides to every question, and that the two sides must be heard before a just opinion can be formed. It provides for a committee of not less than six members, equally divided between the associations represented, and an umpire, who is neither a journeyman craftsman nor an employer of journeymen. The full form may be obtained by applying to Secretary Sayward at the Boston Exchange.

The full report of the umpire, Mr. William Lloyd Garrison, is so well worth the attention of every employer of labor that we publish it in the Manufacturers' Department of this issue.

THE editorial request for opinions on the Roman-shape common brick in our last issue brought us a good many expressions, mostly favorable, from architects. Extracts from these are published in the Manufacturers' Department.

WITH the establishing of a Technical Training School for teaching the manufacture of materials from clay at Columbus, Ohio, the first of its kind in the country, a long stride has been taken in the advancement of scientific brickmaking.

THE selection of Mr. Edward Orton, Jr., to be at the head of the new training school at Columbus, Ohio, is a fitting tribute to a very able young man, and will do much toward establishing confidence among the brick manufacturers of the country, with whom Mr. Orton has an extensive acquaintance.

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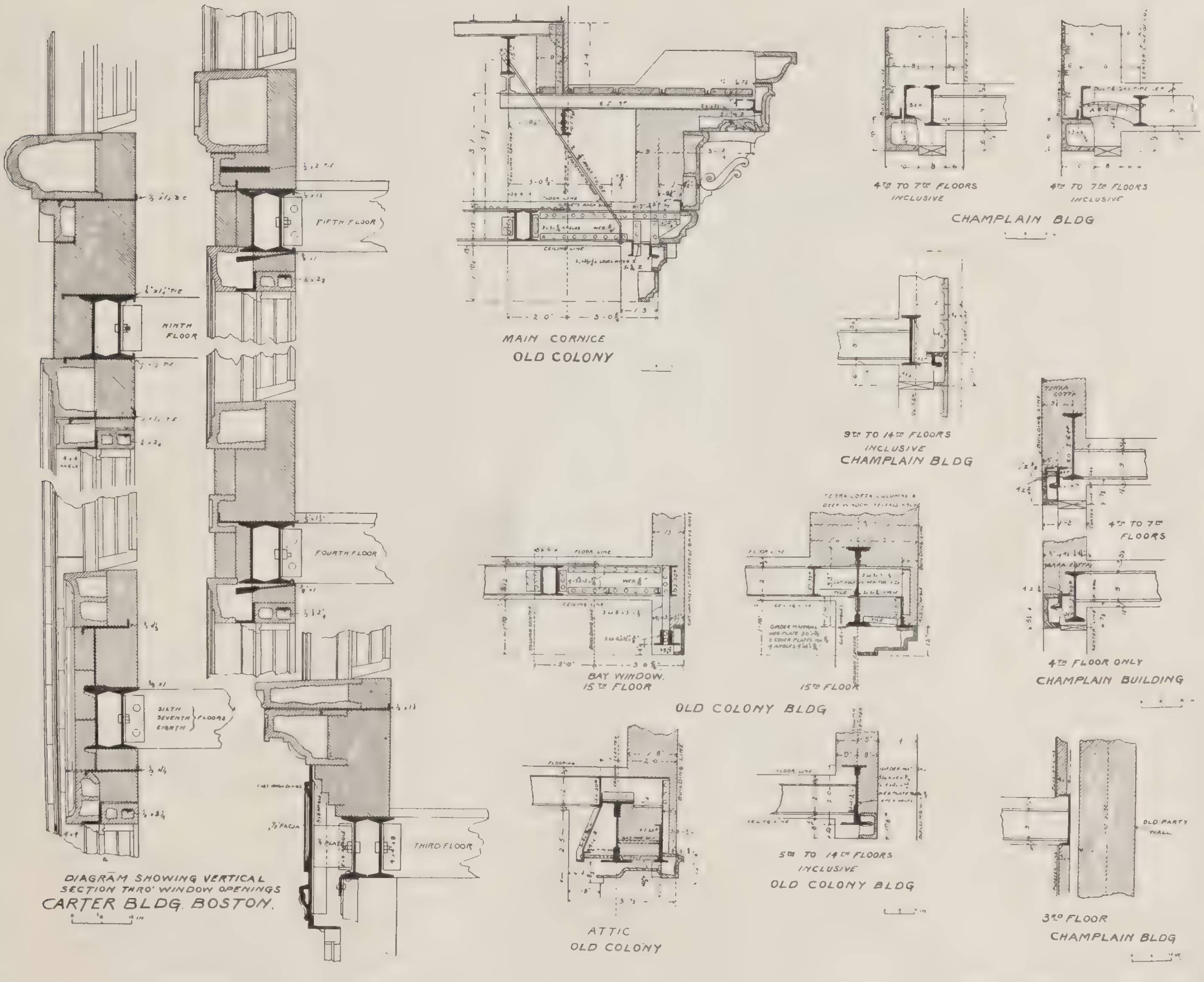

NOTE. — In the above diagrams, the Carter Building sections are reproduced at a scale of three eighths of an inch; the Old Colony Building, three sixteenths of an inch; and the Champlain Building, one quarter of an inch.

TERRA-COTTA IN SKELETON CONSTRUCTION.

(*Continued from May number.*)

THROUGH the courtesy of Mr. C. H. Blackall, architect, Boston, we can see in this issue of THE BRICKBUILDER details of the wall construction of the Carter Building. It is profitable to note what Mr. Blackall says concerning this construction: "I would make a change if I were to do the work over again. You will notice that the outer four inches of the work is practically borne by the corbelling above the beams of the third floor. The face work is tied into the back very thoroughly with galvanized iron ties; still, another time I would carry the constructive steel of each story out to within two or three inches of the front." This is certainly correct.

An important principle in skeleton construction is to support the masonry at every story, thus making the difference of expansion and contraction between steel and masonry imperceptible. It is probably true in the Carter Building that the masonry is carried story by story, being virtually corbelled out from the beams at each floor (otherwise one might expect to find shearing cracks between facing and backing), and it would surely be better, as Mr. Blackall says, to bring these supporting beams within three inches of the building line. It would seem also that the fireproofing of these beams is faulty. The heads of windows are subjected to the greatest heat in a fire affecting exterior walls, and the construction in this case is such apparently that the protecting tiles would soon drop and leave the beams unprotected.

We are indebted to Messrs. Holabird and Roche for the details of the Champlain and the Old Colony, two of their latest buildings in Chicago. These sections are selected to show how varying conditions were met and problems solved in particular cases, and are submitted as being valuable for reference.

The detail marked "Bay-window 15th Floor" shows a construction which has been used frequently in Chicago, but which seems undesirable when it can be avoided. The great leverage on the rivets seems to make it impracticable to obtain the proper rigidity. Whether the cause be poor workmanship leaving rivets loose, or whether mistakes have been made in calculations and deflection followed, at any rate in several instances, in other buildings where this construction has been used for bay-windows, the masonry shows cracks. This leads to the observation that the anchorage of the masonry, particularly the terra-cotta, to the steel should be most thoroughly done. As Mr. Shankland, engineer of the firm of D. H. Burnham & Co., remarked to the writer, "The anchorage of terra-cotta to the constructional steel cannot be shown on the drawings except in a general way, and it should be made a matter of strict superintendence."

The proper anchorage of masonry veneering to the supporting steel is certainly a vital matter in skeleton construction, and solid, heavy wall advocates will have a good case in the future if this is neglected and as carelessly done as it is to be feared has been done in some buildings. An instance is known where a whole section of wall facing on the court side of a high building fell off, all because the workmen omitted the anchors. D. EVERETT WAID.

FIREPROOFING OF MERCANTILE BUILDINGS.

THE problem of the modern fireproof office building has in a general way been completely solved. The cheapest and most logical form of construction for such a building has been found to be the nearest perfection in the matter of fireproofing; but it is not in buildings used for office purposes that the greatest risk of fire occurs. The finish and general character of an office building demand constructive work that cannot be essentially cheapened by building without regard to fire protection. Necessary as it is to have buildings of this class thoroughly fireproof, it is far more important to have those structures of a cheaper and rougher character as perfectly fireproof as present knowledge of construction will make them. These buildings are devoted largely to small manufacturing enterprises or to a jobbing business, and a large percentage of their space is occupied by stock which is almost always more inflammable than the building itself. The wholesale and jobbing sections of our large cities show miles of streets lined with buildings that are a constant menace to the mercantile and manufacturing interests which occupy them. These buildings have exterior walls of brick, and in some cases partition walls that extend from cellar to roof. The floors are composed of ordinary joists set with short distances between the centres and floored with one or two thicknesses of common board. The under side of these joists is left unprotected, and if fire ever starts in the piles of merchandise stored in these buildings, it is well-nigh impossible to save them, or keep the fire from spreading to adjoining structures. There are many new buildings now being erected in our principal cities which are to be devoted to small manufacturing, jobbing, or storage business. These buildings externally are models as examples of architecture; in fact, the most logical, consistent architectural work in the country is to be found in this class of buildings. They render the business sections considerably more interesting than any other to the student of modern architecture. If their interior constructiton were as well carried out as their exterior design, they would be above criticism. What is most needed is a cheap but thoroughly effective method of rendering the interiors fireproof. In the case of a building which is devoted to several businesses, the construction should be such that a fire originating in the portion occupied by any one business could not spread beyond the space occupied by that business. We believe that the increased rents that could be secured for business premises of this character would more than pay for the increased investment necessary for their construction. We would very much like to have architects who have had experience in the construction of such buildings favor us with some notes as to the method of construction and its cost.

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WE give on this page a photographic reproduction of the residence of John H. Inman, Esq., in New York City. This is one of the comparatively few New York residences built with fireproof construction. We are indebted for the photograph to Lorillard Brick Works Company of 92 Liberty Street, New York, whose terra-cotta fireproofing materials were employed in its construction. Although the risk of serious conflagration in residences is slight, still the added amount necessary to make them fireproof is proportionately so small that the feeling of security in such a residence is obtained at little expense.

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A REVIEW OF VARIOUS METHODS OF CONCRETE CONSTRUCTION AS APPLIED IN ENGINEERING WORKS.

I.

THE translation and publication of Choisy's valuable work on "Roman Construction" by Mr. Arthur Dillon comes at a most favorable time, in view of the increasing interest being taken at present in concrete and the use of cement by professional builders.

Viewed as a technical work for reference in practical construction its value is small, inasmuch as the progress in the mechanics arts, in the manufacture and use of cements and the manipulation of concrete, has rendered the Roman methods obsolete and uneconomical, although at the time of their development their very existence was called into being by the demands for economies in labor and materials.

The "Roman Construction" is of especial interest, however, as a means of comparison of the stages of progress made in building from ancient times; the Roman work being a sort of zero mark from which we may start in tracing the development of cements and concrete.

However radically we may find the Roman methods to differ from our own, the principle underlying all is the same. The chemical union of certain compounds which forms the basis of the hardening of cement is the property of the Romans, and subsequent work has resulted merely in the perfecting of a principle which they were the first to use to any great extent.

It is true that we know of mortars and concretes that antedate Roman work fully two thousand years; but although these ancient specimens are real concretes, they were rather the result of accident than of art, and but small traces are found of them. The oldest is from Cyprus,[*] an exceedingly hard and firm lime concrete from the Temple of Larnaca; another is from the Great Pyramid, and is composed largely of a sulphate of lime; while a third is from the Greek Temple of Pentelicus in Athens, and is a real lime and sand mortar, so old that the union of the silica and lime has taken place, forming a very strong, hard stone.

The composition of all is the same as far as the union of the elementary substances is concerned. Lime, silica, and alumina in varying proportions form the basis of all cements, ancient and modern. When nascent lime (CaO) is brought into contact with free or soluble silica, the result is a chemical union. It may be accomplished slowly by mixing fresh burned lime with certain kinds of sand, or by burning lime and clay (silica and alumina) together in properly constructed kilns. The first-named process was that used by the Romans. They had vast quantities of a most excellent sand called puzzolana. It is found near Naples, on the slopes of Vesuvius, and in great beds throughout that part of Italy. A similar material is found along the Rhine and again in the Mediterranean, where it is known as Santorin earth, from the island of Santorin in the Grecian Archipelago.

The composition of these is similar, and consists of about fifty per cent silica, sixteen per cent alumina, twelve per cent iron oxide, nine per cent of lime, and small proportions of other ingredients, chiefly alkalies.

The distinctive quality of the puzzolana lies in its power of uniting quickly with lime to form a cement mortar. The silicates are of such a quality as to unite readily with nascent lime. The lime rock was quarried near at hand, and when burned was immediately slacked with water and mixed while hot with the puzzolana. The mortar so formed was used at once, being in some cases mixed with sand to prevent excessive shrinkage.

The wall construction was carried on in successive layers of stone and puzzolana mortar, and the result was ultimately a hard, compact, rigid concrete wall. Once in place the concrete continued to harden indefinitely, and its marvellous lasting quality is witnessed in the ruins of those ancient works, which would have long been swept away but for the solidity and massiveness of the concrete masonry.

The puzzolana is still in great demand and makes the finest mortar in the world. The catacombs of Rome were formed by the excavation of the vast quantities of this remarkable sand, used in the Roman works. The presence of a moderate quantity of alumina in its composition renders it moderately hydraulic; and although its slowness of setting limits the range of its usefulness in damp localities, it is an interesting fact that when Smeaton rebuilt the Eddystone Lighthouse in 1756, he used for concrete Aberthaw nefra lias lime, which he burned on the works, and puzzolana sand shipped from Civita Vecchia.

II.

It is proposed in subsequent papers to describe the essential characteristics of limes and cements with a view to arranging the various kinds in the order of their importance in building construction.

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[*] Journal Franklin Institute, Vol. LXXIX., Wm. Wallace, Ph. D., etc.

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The progress in the manufacture of cements has brought concrete into the first rank of importance in engineering works; and as the grades of cement multiply, and concrete comes more and more into use, it becomes a matter of duty with every engineer and architect, who pretends to be a professional man, to make himself familiar with the various brands of cements and their relative values in practical work.

The manufacture of concrete is more of an art than most people suppose. It involves a knowledge of the qualities and nature of cements, of the relative value of aggregates, of the proportions of ingredients for various purposes, of the numerous methods of re-enforcing in order to secure the full working value of the materials, and in fact it is a department of engineering by itself and demands special training as much as does iron construction or stone masonry.

Concrete is one of the most reliable of all materials with which we have to deal. If it is treated properly, it will never fail of its duty. In the first place the manufacture of concrete involves honesty; and if that is not to be had in those who do the work, the remedy is to be found in the ability of the architect to specify and direct his own construction. The architect must know what is proper, and insist upon his ideas being carried out. One grade of cement is not as good as another, even if it is marked "Portland" and has the same market value. One grade of stone is not as good as another, even though it be "clean and free from dust."

The lack of knowledge and the indifference of architects and engineers are responsible for the poor concrete that we hear about. Use proper materials in a proper fashion and there will not be so much said about its inability to withstand frost or the weather or fire or the sea. Concrete, when properly made, has demonstrated that it is just as serviceable in New York as in San Francisco. It will endure as long in Minnesota and Halifax as in New Orleans and Florida.

There is not a terra-cotta tile floor on the Continent of Europe. The great submarine works of England and France tell of its value in docks and marine masonry. But such work demanded care and watchfulness, integrity and skill, a knowledge of the behavior of cements and their relative values in the various capacities in which they were used. Concrete for floors is a very different material than a concrete for foundations; and the building of a weather wall requires a specification essentially different from that used in the laying of subways and conduits.

It is hoped that as the use of concrete comes more and more into favor, that those engaged in the building professions will realize the necessity of rigid specifications and correct management in the handling of concrete, that this splendid material may be more fully developed, and its many virtues more thoroughly realized.

III.

It is a common practice in mortar making to use more or less cement with the lime. It would be valuable to have some reliable testimony regarding what seems to be a rather questionable method of improving common mortar. Surely the mortar that is used in our construction these days is poor enough, but it is uncertain whether the use of cement in limited quantities is of any value in bolstering it up.

There is no reason for such abominable stuff as goes into our floors and wall work, and it is not surprising to see the bricks come out of a wall as clean as the day they were made. We have most excellent bricks, and if the quality of the mortar were equally as good, it would require considerable more trouble to pull a wall down than is involved at present. Cleaning bricks is a simple matter in Boston.

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SEND FOR CIRCULAR AND CATALOGUE.

MORTAR COLORS AND STAINS.

THEIR USE AND ABUSE.

THE practice of using artificial coloring for mortars and cements has been in vogue more or less for two thousand years back, but the general use of mortar colors and stains is of comparatively short duration, indeed within the memory of the present generation.

There is no doubt but that its increasing favor and demand by architects, builders, and the trade in general is a sure and ummistakable sign that mortar color has come to stay, coming more and more into use as its merits are understood and appreciated, until within the next decade it will not only be used in the more costly and larger buildings, but in factories, dwelling-houses, etc., and all the cheaper or common work.

Like all the important advances in architecture and other lines, it has taken years of careful study and experiment, attended sometimes by failure but finally by success, to bring its manufacture and application where it is to-day, nearly perfection.

The manufacture of stains and colors exclusively for mortars and cements was first attempted, we believe, several years ago by the well-known and reliable firm of Sam'l H. French & Co. of Philadelphia, Penn., to meet an urgent demand from leading architects for something which would add to the exterior ornamentation especially of brick fronts. The first obstacle which presented itself and which this energetic firm finally overcame was to secure something that would not deteriorate the quality of the mortar with which it was mixed; and having successfully put aside this difficulty, they turned their attention to the strength and durability of the color, endeavoring to produce an article that would materially increase the strength of the mortar with which it was used. After many tests and experiments this was finally accomplished, and the production of mortar colors took a long stride forward.

It may not be amiss at this time to review as briefly as possible the principal colors, and endeavor to show where they may be used to produce the best results.

Red. Of all the colors this is probably by far the most used and gives the best satisfaction, whether used to produce a massed effect with red brick, which is generally the case, or in contrast with buff Zanesville, Milwaukee, or Pompeian bricks. Probably the best brand for all-around work, and certainly a general favorite throughout the United States, is that made by the Clinton Metallic Paint Company and termed "Clinton Hematite Red." It contains seventy per

Mannheimer Portland Cement.

UNEXCELLED IN QUALITY.

"The results of tests with standard quartz are far above the average of most cements."
CLIFFORD RICHARDSON,
Inspector of Asphalt and Cements,
Engineer Dept., Washington, D. C.

"This brand of Portland Cement was found especially qualified for the purpose of concrete casting on account of its perfect uniformity, intensive fineness, progressive induration after the first setting, and of its great tensile and crushing strength."
Vide Report of CARL A. TRIK,
Superintendent of Bridges, Philadelphia,
On Concrete Arch Highway Bridge over Pennypack Creek.

MORRIS EBERT,

IMPORTER AND SOLE AGENT FOR UNITED STATES, CANADA AND CUBA.

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Postal Telegraph Building, 253 Broadway.

GENERAL OFFICE,
302 Walnut Street, PHILADELPHIA.

The Alpha Portland Cement.

Its superiority is fully established; for fineness, uniformity of color, and great tensile strength it is unexcelled. Every barrel of **"ALPHA PORTLAND CEMENT"** guaranteed equal to the very best brands of "German Portland Cements," and its minimum tensile strength guaranteed as follows:

Sole New England Agents,
JAMES A. DAVIS & CO.,
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WM. J. DONALDSON & CO.,
Betz Bldg., Phila.

GUARANTEE.

1 day in air, 6 days in water,	400 lbs.	Neat test Per square inch.
1 " " " 27 " " "	500 "	
1 " " " 3 months in water	600 "	

3 parts of sand to 1 of cement.—Adhesive test.

1 day in air, 6 days in water,	125 lbs.	Per square inch.
1 " " " 27 " " "	175 "	

FINENESS.

Residue on sieve No. 50,	None.
" " " " 100,	10 per cent.
Passing through sieve No 200,	65 "

Every barrel guaranteed to stand the boiling test, the test for safety.

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Is superior to any other Portland Cement made. It is very finely ground, always uniform and reliable, and of such extraordinary strength, that it will permit the addition of 25 per cent more sand, etc., than other well-known Portland Cements, and produce the most durable work. It is unalterable in volume and not liable to crack.

8,000 barrels have been used in the foundations of the Bartholdi Statue of Liberty, and it has also been used in the construction of the Washington Monument at Washington.

Pamphlet with directions for its employment, testimonials and tests, sent on application.

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E. THIELE,
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ESTABLISHED 1858. WILLIAM N. BEACH, President.

LAWRENCEVILLE CEMENT CO.,

MANUFACTURERS OF

BEACH'S ROSENDALE HYDRAULIC CEMENT.

Guaranteed to stand all required tests. 115 Broadway, NEW YORK.

cent of iron oxide, and when mixed with lime mortar considerably hardens and strengthens it. This color is also used to a large extent on sandstone and granite work, of which a good sample is furnished by the Boston and Albany Railroad Station at Springfield, Mass. This color will cost about two cents per pound, and will require fifty to sixty pounds to color sufficient mortar for one thousand brick.

Brown. Brown is being largely used at present with dark red brick in massing, but contrasts pleasantly with nearly every color but red. Some authorities consider brown the strongest color used, but on what grounds is not made plain; its cost is about the same as red.

Black. In using black it will be found necessary, in order to get the best results, to get the best brand to be had. Lampblack is never satisfactory, as it causes the mortar with which it is mixed to become spongy, thereby increasing the liability of the bricklayer to daub the work, which is hard to prevent with the best color. Powdered coal, foundry sand, and forge blowings are sometimes used, but furnish a poor substitute indeed. Great care must be taken in making black mortar to mix it thoroughly in the bed, and thus prevent the possibility of different shades of mortar when the work becomes dry. Color for mortar to lay one thousand bricks will cost about sixty cents.

Buff. Generally used in massing buff brick, just now much in favor in this country, but forms a beautiful contrast with black or red. Cheap brands are liable to fade, but the best will not.

This color costs about the same as brown.

As before stated, these four colors are the principal ones, but there are several other shades used more or less. Among them, green, Pompeian buff, royal purple, French gray, and colonial drab are the most prominent, and form pretty contrasts to some shades of brick, and it costs about $1.20 for color for one thousand brick.

One great objection brought forward by critical minds to the use of mortar colors is that it fades. To a certain extent this may be true in the case of cheap brands and lack of skill in its application, but good mortar colors, when properly mixed with the mortar, seldom, if ever, fade. A few simple directions, if properly followed, will insure good results. Mix up your mortar the same as usual, if possible a day or two before you want to use it. The object of this is to give the mortar an opportunity to cool before adding the color, as the hot lime is liable to diminish the strength and dim the color. Be careful to have the mortar well tempered when the color is added, and, to insure uniformity, give them a thorough hoeing together. It requires about forty pounds of the black, and sixty pounds of the red, brown, buff, and most all other colors, for sufficient mortar to lay one thousand brick. These proportions vary according to the thickness of joint and depth of color desired. The color which comes in putty form is preferable to the dry, we think, but should always be kept damp to prevent it from hardening, and thus make it difficult to mix with the mortar. After opening the package, keep a small quan-

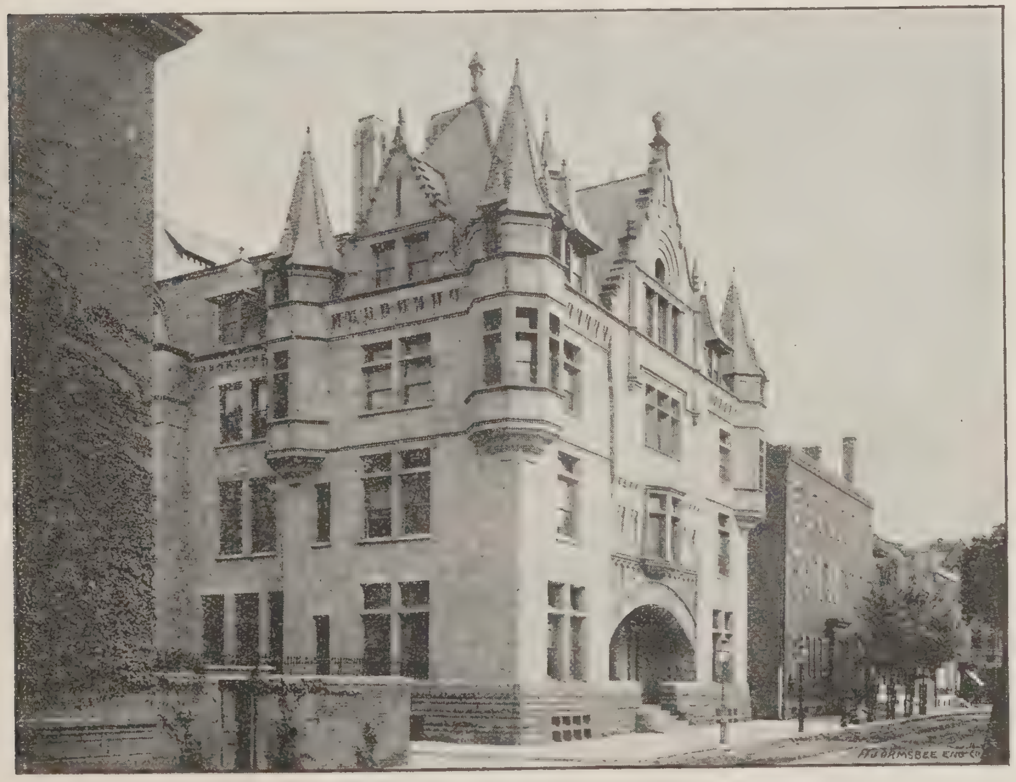
ATLAS PORTLAND CEMENT.

WARRANTED EQUAL TO ANY AND SUPERIOR TO MOST OF THE FOREIGN BRANDS.

OFFICIAL TESTS, Nos. 3567 and 3568, made by the DEPARTMENT OF DOCKS, New York, March 31, 1894, being part of contract No. 464 for 8,000 barrels.
TENSILE STRENGTH, 7 days, neat cement . . . . 622 lbs.
" " 7 days, 2 parts sand to 1 of cement . . . . . . 332 lbs.
Parts steamed and boiled . . . . Satisfactory.

All our product is of the first quality, and is the only American Portland Cement that meets the requirements of the U. S. Government and the New York Department of Docks. We make no second grade or so-called improved cement.

ATLAS CEMENT COMPANY, 143 LIBERTY STREET, NEW YORK CITY.



Holy Trinity Parish House,

PHILADELPHIA.

◆◆

Buff and Pompeian Brick Laid in Clinton Hematite Red.

◆◆

Messrs. Hewitt & Bro., Architects,
PHILADELPHIA.

◆◆

Messrs. Dorsey & Smith, Builders,
PHILADELPHIA.

◆◆

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"A Little Talk on Metallic Paints and Mortar Colors."

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CLINTON METALLIC PAINT CO.,
OF CLINTON, N. Y.

. . . . MANUFACTURERS OF. . . .

High Grade Mortar Colors and Metallic Paints.

Eastern New England Agents:

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tity of water on the color, which must, however, be removed before using. Last, but not least, never wash down a building with any acid but muriatic, and that not too strong, as all acids will take out the color more or less.

One advantage in using colored mortars is the opportunities they furnish the builder of using rougher brick and odd shades. A building laid up with red mortar and common ordinary brick as they come from the kiln will make a much better appearance than the same brick culled and using white mortar.

Another use to which mortar colors are put at the present time is for tinting the finishing coat of plastering, and when properly executed makes an excellent appearance. The following shades, may be produced from the four principal colors: red will make tints from light pink to dark terra-cotta; brown, from light reddish brown to Bismarck; black, pearl color, French gray, and steel; buff, from leather color to heavy buff. Blackboards for schoolhouses may be colored with the black.

The colors should be thoroughly incorporated with the white stuff before running off, in such quantities as may be necessary to make the desired tint. It requires about three quarters of a pound of color to a square yard of plastering. This is applied in the usual manner. Care should be taken, however, in making a hard finish, to keep the slobber off the trowel.

NEW BRITAIN, CONN. R. N. BUELL.

BOILING TEST OF CEMENTS.

OFFICE OF BOOTH, GARRETT & BLAIR,
Chemists,
PHILADELPHIA.

EDITOR BRICKBUILDER:

Sir, — I note the item in your paper in regard to boiling tests for cement. Our firm has kept a boiling apparatus in use for rather more than a year past, and, in addition to regular tests, have made a great many experiments. As a result of this experience, we are inclined to doubt the efficacy of the boiling tests as a means of detecting free lime.

A paper dealing with the matter more fully will be presented before the A. Soc. C. E., in September.

Yours truly,
FREDERICK H. LEWIS.

THE USE OF ROCK EMERY FOR GRINDING.

IT is only within a comparatively recent period that any improvement has been made in millstones, but this advance has been of a most important character, and consists in substituting for the ordinary millstone, grinders made of blocks of rock emery. Emery possesses all the properties of an ideal grinding stone. In hardness it is scarcely surpassed by the diamond, and has no equal as a destroyer of all other substances. The surface of a block of emery can be smoothed to any degree for fine grinding, yet the face never glazes, but remains sharp under all circumstances. It is remarkable that this substance has been so long practically unknown to millers; but heretofore it has not been thought possible to form so refractory a material into any regular shape. By the happy expedient, however, of setting the large blocks of emery in bronze, this has finally been accomplished, and a strong stone constructed that is as nearly indestructible as a millstone can be.

The metal in the face of this millstone, being softer than the emery, wears slowly away, slightly exposing the hard emery edges that cut like sharp files. The slightly recessed metal surface forms a honeycombed face far superior to that of the best French buhr, and infinitely harder and more abrasive.

The rock emery millstone is exactly like the old stone, except that it is made of a substance as much harder and sharper than the best French buhr, as buhr is harder than soapstone.

Rock emery millstones are made in sizes to fit any mill frame, and can take the place of other stones without any change whatever. They are the fastest and steadiest fine grinders known, as it is never necessary to stop the mill, except in grinding hard rock to dress down occasionally the stone eye and furrows, which are made of softer material, so as to be easily cut away. The emery face never requires it.

Rock emery millstones are only slightly more expensive than French buhrs, which they can easily grind to powder. They never fail to replace other grinders when run in competition with them. They of course grind wet or dry, the same as other millstones, and are managed in exactly the same manner, only, as before stated, the durability of the emery face is such that it never requires to be picked. They are made sharp and stay sharp.

These millstones are made in large numbers by the Sturtevant Mill Company, No. 88 Mason Building, Boston, Mass., sole manufacturers. Send for circular.

ABERTHAW CONSTRUCTION COMPANY (Incorporated),
CONCRETE ENGINEERS
FIREPROOF FLOORS (Ransome System).

For Public Buildings, Hospitals, Schoolhouses, Office Buildings, Warehouses, Breweries, Stables, and Dwellings.
Contracts taken for all work in Portland Cement Concrete.

Foundations, Bridge Piers, Engine Beds, Retaining Walls, Pavements, Self-supporting Sidewalks and Sidewalk Lights (Ransome Patents).
Best Materials and Highest Skilled Workmanship.

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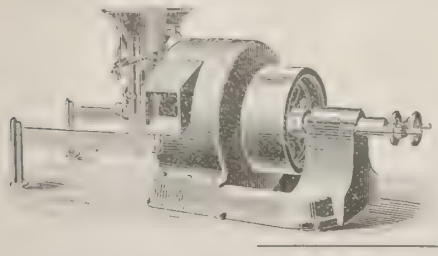

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AND PATENT
TRADE
ROCK EMERY MILLSTONES.
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FIT ANY MILL FRAME.

Fastest fine grinder known.
Sturtevant Patent Vertical Mill has no rival for reducing ***Plaster, Paints, Chemicals, Carbons, Talc, Soapstone, Slate, Barytes*** and like materials. 30" Mill Costing but $400, grinds to fine powder firom 1 to 4 tons per hour. No foundations, no screens, no noise, no dust. Remember that for $400 you have a machine that is ***ready to run*** and that will keep running longer without repairs than any other fine grinder. Send for special circular.
Made of Blocks of Rock Emery set in Metal, making the hardest and most cutting millstone ever bult, and not expensive.

A Customer Writes:

SELLERSBURG, IND., June 25, 1894.
We can grind from 70 to 75 bbls. Louisville Cement per hour with your Rock Emery Stones. This is from 10 to 15 bbls. more per hour than our ordinary stones will grind. Since May 3 have dressed these but twice. Ordinary Stones we dress every three days. Rock Emery Stones save us several dollars per week in dressing alone.
CLARK COUNTY C. CO.

RAPID — because Rock Emery has no equal for cutting qualities. ECONOMICAL — because Rock Emery is the most durable grinding surface known. NO EXPERIMENT — because many large manufacturers in your own line already use and indorse them, and hundreds in use for other purposes.

SEND FOR CIRCULARS AND REFERENCES.

STURTEVANT MILL COMPAMY, 70 KILBY ST., BOSTON.

THE MANUFACTURER.

A Department devoted to the Market Side of Clay Production.

ROMAN-SHAPED COMMON BRICK.

REASONS FOR AND AGAINST ITS MANUFACTURE.

WE published in our last issue a letter from a correspondent inquiring whether common brick had been or were being made Roman shape, that is, 1½ x 4 x 12 inches in size. We commented upon this inquiry editorially and called for the opinions of architects, brick manufacturers, and machinery men as to the demand for such a brick and the practicability of manufacturing.

The only communication from a brick manufacturer was that from the Kensington Brick Co., which we give here and to which we call the attention of all architects favorably inclined toward the Roman-shaped common brick.

KENSINGTON BRICK COMPANY, 79 Fourth Avenue, Pittsburgh.

"In reply to your inquiry in the June number, would state that we made a red Roman brick on the Simpson dry-press machine which was used in the Carnegie Office Building, located on Fifth Avenue, this city, which is about seventeen stories high.

"In reply to your inquiry for common stock brick, Roman size, would say that we can make a stiff mud brick, Roman size, and have made them, but there being no demand in this market for same, we of course stopped. We can make the brick by either the stiff-mud or dry-press process, and should there be any demand for same in your market we would be glad to quote prices. We are about commencing on an order for Norman tile made on the stiff-mud machine with rock face for a church in Pittsburgh, and we think it will make a handsome building. We are in shape to make anything there is any market for."

We have also received many letters representative of the machinery side of the question, which would indicate that there is no obstacle in the way of manufacturing such a brick unless it be in handling the brick after it leaves the machine. One of these which expresses the general opinion we quote below. It is from

THE MCLAGON FOUNDRY CO., Brick Machinery Department, J. Wheaton Stone, Manager, New Haven, Conn.

"We have noticed the inquiries regarding the manufacture of common stock brick in Roman shape that appeared in THE BRICKBUILDER last month. We can think of no insurmountable objection, providing the market calls for them. They may be successfully made by any of the prevailing methods of manufacture; and they are, but usually in small quantities and from high-priced material, producing fancy colors. Made in large quantities we should say they would be a little more expensive than brick of ordinary shape. They contain about the same amount of material, and we presume they may be made and dried as cheaply as any. Owing to their shape, probably, they could not be handled and set in the kiln as readily, nor are they quite as convenient to handle after they are burned. There would naturally be a greater loss from breakage. The cost of burning, we presume, would be about the same as the ordinary size. To make them cheaply, therefore, it is not a question of machinery so much as it is the expense of handling them after they leave the machine. If the market were great enough to enable the brickmaker to make them exclusively, they could be made to better advantage than when mixed with other sizes. They could be made with our 'New Haven' machine as readily as brick of ordinary size. However, we doubt if Roman brick will prove as satisfactory for general building purposes as the standard size, and therefore do not anticipate that the demand will be sufficiently large to warrant an extensive production."

The expression of opinion that we have received from architects is most gratifying. The majority of them speak decidedly in favor of the manufacture of such a brick, and we have no doubt that at least seventy-five per cent of American architects would regularly use a good quality common brick made Roman shape for exterior work in a great many places where they would not use the standard shape. A few of the letters we have received speak discouragingly of manufacturing such a brick, and these we quote from first.

VONNEGUT & BOHN, Indianapolis, Ind.

"We do not believe that there would be a very great demand for such brick from this locality."

KENDALL & STEVENS, 8 Oliver Street, Boston.

"Personally we do not see any advantage in making common brick in this size and shape. The additional care needed to produce a reasonably straight brick, and the greatly increased danger of fracture under concentrated load, seemed to us to offset the advantage of greater bond, unless the bricks were to be like the old Roman bricks, almost vitrified in burning."

W. J. MARSH, 1503 Pennsylvania Avenue, Washington, D. C.

"Sometimes from an æsthetic point of view the Roman-shaped bricks are desirable for exterior work, and when massed they reduce the scale and apparent size very considerably. The labor of handling them, however, is greater than for standard bricks, and I see no advantage in the use of this size for common bricks, the standard size being more economical in every respect, and as good constructively as the Roman."

There are none of the above we believe who would not avail themselves occasionally of Roman-shaped common brick. They merely doubt the expediency of manufacturing such a brick, believing that the greater expense would stand in the way of their use. Out of the total number of letters that we have received, however, the opinion is so decidedly in favor of this brick, even at a little higher proportionate cost than the standard shape, that we are certain it would pay those manufacturers of common brick who are near large markets to try the experiment of manufacturing the Roman shape and bringing it directly to the attention of architects in their respective localities.

Hapgood & Hapgood, Architects, Hartford, Conn.

"We would be very glad to use the common brick made in Roman shape."

Nolan, Nolan & Stern, Architects, Rochester, N. Y.

"We think that if common brick were made of Roman-shape size they would be used occasionally by architects when the occasion required; for example, in order to obtain some special effect in wall surfaces, pointing, etc.

"We trust that if common bricks are made in this size and kept in stock, we will be advised of the fact. We will, no doubt, have opportunities of using them in some of our work."

Muhlenberg Bros., Reading, Penn.

"We are very much in favor of a Roman-shape common brick, and would use it frequently. It would give more play in detail, and make a finer moulding. We are glad you are agitating the subject, and hope to see the manufacturers introduce them."

Green & Wicks, 110 Franklin Street, Buffalo, N. Y.

"In reply to your editorial asking an opinion on the subject of Roman-shape common brick, we have to say that we would be very glad to use the same if they were procurable, and hope that they will be before long."

Edw. Ogden & Son, Albany, N. Y.

"We have seen the articles in your June number, and think that Roman shape common brick would, if put on the market, receive instant recognition as being capable of very effective work. It is impossible to set any standard size, as sizes vary in different localities, but it might be very conveniently the depth and width of common brick and half as long again."

Moses & King, 431 Walnut St., Philadelphia.

"We would consider a common brick stretcher, Roman size, an exceedingly useful article, and would not hesitate in saying we could place them in many buildings where the 'ornamental' bricks are too expensive. Trust you may succeed in your good efforts."

Warren & Bacon, 9 Park Street, Boston.

"We noticed an inquiry with regard to Roman-shaped common brick, and your editorial on the subject in the June number of your paper. We are sure that any brick manufacturer who would manufacture a good common brick of this shape would find an immediate demand for it. We ourselves should be glad to use it on every opportunity. We believe that the manufacturer could charge one third more for Roman-shaped brick, to allow for the necessary greater care in handling and probable waste, and still find customers. The bricks would require no more clay, and no more room in the kiln or in carting."

Wm. Martin Aiken, Johnston Building, Cincinnati.

"I do not know of any manufacturers who make common brick in Roman shape. At the time when I was a student in the office of the late H. H. Richardson he had common brick made to order for Sever Hall, Cambridge, and Trinity Church Rectory, Boston; these bricks, as I remember them, were 12" long and 2¼" thick. If a sand-struck brick 1½" x 12" could be placed upon the market cheaply, I, for one, would be very glad to encourage its use in suburban architecture, for the sake of the softness and richness and depth of color not otherwise obtainable."

Marshall S. Mahurin, Fort Wayne, Ind.

"Your editorial relative to an expression of opinion on Roman-shape common brick cannot fail to meet my approval. Of course such are not in this market. We have a very fine standard shape common brick, in color a yellowish red, rather dark. We have used the same in connection with a mortar stain near the color of the brick as we can get, and from an artistic point of view we have a result superior to a press brick, getting a very soft plushy surface, with a delicate variegated effect and entirely free from the dead, waxy tone so common in first-class brickwork. Should Roman-shape common brick be produced, think they would be appreciated by the profession, especially the darker shades of red and yellow."

Yarnall & Goforth, 14 South Broad Street, Philadelphia.

"Replying to your editorial in the June Brickbuilder in regard to making common brick in the Roman shape, we beg to say that we would be very glad to see such an article on the market, and we believe it would have a large sale. There are many times when it could be used with most excellent results. Rough, hard bricks, unfortunately, are looked upon by many clients as cheap and unfit for use in a good building, but we believe if they were made up in the Roman shape, clients would be more willing to accept them as a proper facing for front walls. At this writing we have an operation just going into the contractors' hands in which we would gladly substitute Roman shape for the standard size common brick specified, if we knew where they could be obtained at a reasonable price."

J. A. Dempwolf, York, Penn.

"It would be a pleasure to lay up many of our walls which are now built with common standard brick in the Roman size, thus making a much more attractive appearance.

"I remember seeing in Rome many of the old walls built with thin, long common bricks throughout, the bond of which, no doubt, accounts to some extent for the strength these walls possess.

"I think, however, that the increase of labor and the consequent cost of manufacture, besides the greater care required in handling the Roman-size bricks, will debar them from becoming popular for the building of ordinary walls.

"I do not know of any manufacturer who makes common Roman-size bricks, but shall watch with interest the opinions of your readers."

C. H. McClare, 613 Main Street, Cambridge, Mass.

"In regard to your editorial in the June number *re* Roman-shape common brick, I would say that I think that there is no doubt that if they were made there would be a market for them. They could be used for bonding with the mottled varieties, or would give a good texture to a wall surface laid up with them in common or Flemish bond, and would make stronger work than the common bricks. The question is whether they can be made as easily or cheaply as the common brick. From what I have seen of the manufacture of the latter, I should think that they might, as they are thinner and would burn more quickly, thus requiring less fuel and attendance. I wish to say a word in commendation of The Brickbuilder. It fills a place that is not covered by any other architectural paper in this country, and I am sure it deserves great success."

Frank Miles Day, 925 Chestnut Street, Philadelphia.

"I am of the opinion that common bricks of Roman shape could be very advantageously used. When travelling in the North of Italy last winter I saw so many examples in which such bricks were successfully used, that the question why our manufacturers in America did not make them was continually forced upon me. I am sure that if put upon the market they would be used by many architects. The regular Roman size, 1½ x 4 x 12 inches, would be a very good size; but I do not see why the common-size brick, if made one and one half inches thick, could not also be used with advantage, though, doubtless, they would look no better in the wall than the Roman size, and might be harder to handle. If the price of such brick could be kept down close to that of common brick, I mean good stretcher or hard straight, dark red, hand-made bricks, there would, I have no doubt, be a considerable market for them."

Guy Kirkham, Springfield, Mass.

"The red brick is like the bay horse, — the most satisfactory, by all odds, to have in the majority. So many structures are being built of buff, cream, and the light-colored bricks, that we value and desire the common red as a relief and a contrast. A good quality common brick in Roman shape would be warmly welcomed by the architects. The uncommonplace shape and with it the lower cost would insure its wide acceptance. The possibility of getting the color and texture of common red brick in combination with the existing colors and textures in Roman shape opens a most inviting field."

Yard Equipment.

DECISION OF UMPIRE OF JOINT COMMITTEE, MASON BUILDERS' ASSOCIATION AND BRICKLAYERS' UNION.

I have carefully considered the arguments on each side of the contention between the Mason Builders' Association and the Bricklayers' Union No. 3 of Boston and vicinity, as given at the hearing, Wednesday, June 27, and herewith state briefly the points at issue and the conclusion forced upon me.

The members of the committee of the Mason Builders' Association aver that, in consequence of the present depressed condition of business building has decreased, values have declined, and that, at the former rate of wages and material, there is no inducement for owners of real estate to venture on new enterprises. They therefore ask that the reasonable reduction in wages of bricklayers of 4 cents per hour, or about ten per cent, be yeilded, from date to Jan. 1, 1895. The present agreement is on the basis of 42 cents per hour and eight hours a day, overtime to be paid for at an added rate of 50 per cent or "time and half," as it was expressed.

Collateral arguments and instances were adduced, but the above is the chief ground upon which abatement is asked. Selfish interest was disclaimed, and the lessened wage, the builders believed, by stimulating business, would result in more and steadier work for the bricklayers.

To which the members of the committee representing the Bricklayers' Union rejoined :—

First.—That the gravity of the alleged depression was exaggerated, and they endeavored to show from figures obtained at the office of the inspector of buildings that the first four months of 1894 show an increase in the number of completed buildings above the same period of 1893, implying that the hard times had failed to materially injure the building business.

Second.—A weighty reason why wages in Boston should not be cut was their present low rate as compared with other cities of the country, New York, Baltimore, Indianapolis, and Denver paying 50 cents per hour, Philadelphia 45 cents, St. Louis 55 cents, and Cincinnati 56 cents, all on a day of eight hours. Buffalo pays 36 cents and St. Paul 45 cents, both on a day of nine hours.

Third.—The irregularity of work and the large amount of time lost through enforced idleness—not only from cessation of outside bricklaying in wintry weather but from unavoidable delay of material and waiting for other mechanics at all times—really reduces the seemingly high rate of wages to a low average. It was affirmed and not denied, that the average workman does not earn over $11 to $12 per week, or about $600 per year.

Other contentions there were, but the three given cover the points deserving attention.

The amicable spirit of both parties and the evident desire to arrive at a just conclusion were manifest. In the same spirit let me consider the points raised.

I agree with the Mason Builders' Committee that the present depression is serious; that buildings have been put up on speculation in excess of the demand, that new enterprises are checked, contracts are few, and that the large number of empty houses for sale and numerous idle bricklayers are sufficient to show the situation. I am not convinced, however, that a small abatement of mechanics' wages will stimulate new business.

The first contention of the Bricklayers' Union Committee is baseless and misleading. The increased number of buildings completed in the first four months of 1894 does not disprove the great depression, for it is evident that the initation of these completed buildings antedates the panic. If the dates of beginning and the length of time occupied in the building were given, the statistics would be found valueless in this discussion.

The second objection urged against the cut of wages proposed is the comparative low price paid in Boston when the other great cities are considered. On its face it is a strong point, but conditions are always found on examination to account for the discrepancy. If there were no counterbalancing advantages in living in Boston over living in Cincinnati, it is safe to say that with bricklayers' wages at 56 cents per hour in the latter place as against 42 cents here, there would be a hegira of workmen from this city to that. But the fact remains that, instead, bricklayers are drawn to Boston, and, as appeared in the testimony, from cities where the nominal wage is higher.

An agreement of 50 cents per hour in Denver means nothing when building is paralyzed, as at present, and employment in that line practically suspended.

The third reason for leaving undisturbed the current pay has decided force, correcting the unwarranted conclusion that large wages per hour are necessarily large in the gross, as was satisfactorily explained, by unsuitable weather and inevitable delays from causes beyond the bricklayers' control.

I deem it unnecessary to elaborate further the arguments or pleas advanced on both sides, and proceed to give the conclusion I have reached.

If the hard times and the dulness in building were caused by excessive wages paid to bricklayers and other similar mechanics, there would be ample reason for granting the mason builders' request. But it is evident that such is not the case and that some undefined cause makes the lot of both parties a trying one. Attempting to curtail the earnings of either cannot therefore be effective. Moveover, the mason builders have this advantage, they enjoy opportunities for profits on contracts that may furnish a fund with which to tide over such times as the present. The bricklayers have no chance for exceptional profits, and, while their wages may be adequate to support themselves and families in prosperous times, they are in trouble when work fails them.

Again, for the mechanic to raise his wages is a hard and slow process, and if lowered to meet an emergency involves great exertion to recover them as times improve. They are consequently the last item of expense to be deliberately reduced.

It may pertinently be asked, if wages were fixed at thirty-six cents instead of forty-two, who would benefit by the concession? Chiefly the mason builders, who have unfinished contracts estimated at the higher figure. It would be a transfer without consideration from the laborer to the employer. New contracts would be figured on the cut rate, and unless increased building resulted from diminished wages, nothing would be gained.

My own belief is that the primal cause of the cessation of building centres in the excessive and speculative advance in land values (aggravated by the financial distrust of our national credit) and that the return of better times must be preceded by the decline of the prices demanded for land. When they fall capital will again be encouraged to invest in new buildings. Land values are the last thing to decline in a panic, but until they do enterprise is checked and labor waits. The real enemy against whom both builders and employees should unite is land speculation, for he who controls the opportunity controls also the profits of him who uses it.

Convinced, therefore, that no general gain will accrue to the mason builders by the cut of the bricklayers' wage, and that the amount is too small to signify for the stimulation of business, I therefore decide that no abatement from the current rate be made.

Permit me to express my gratification, in view of the deplorable labor conflict now raging in the West, that you have instituted this fair and reasonable method of adjusting your differences of opinion.

Respectfully,

[Signed.] WM. LLOYD GARRISON, Referee.

BOSTON, July 6, 1894.

THE United States Brick Press Works, 72 West Washington Street, Chicago, have recently issued a new condensed sheet containing information in regard to their well-known press. Any parties interested in presses should not fail to write for this circular, for it is businesslike and to the point.

THERE are front brick and front brick, but certain it is that the particular front brick which Webster, Gillespie & Co. of Philadelphia are turning out by the aid of their new Simpson presses need not shrink from comparison with any on the market. To produce face brick that will answer the requirements of to-day is by no means an easy matter. There is no continued run of luck in it. It means attention, skill, and modern appliances. With these you may turn out good uniform brick, at least you may take chances on doing so; but lacking any one of these three, and you may assure yourself that you are not taking chances, for in truth you have no chance at all. You are out of the race, and must take a back seat, while your more enterprising competitor wins the prize. Remember, "Those were the good old times," won't do for a motto for the successful yard of to-day.

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Clay Materials.

NOTES FROM BERLIN'S BRICK INDUSTRY.

THE STANDARD BRICK COMPANY is the latest addition to the brick yards of Berlin. The new company is the result of the efforts of Messrs. Whitney & Dickinson, who have long had the project in view. The yard is to be situated just east of C. P. Merwin's, and a side track from the main line of the N. Y., N. H. & H. R. R. to the yard has already been laid. The boilers are being set and the engines bedded by the H. Wales Lines Company of Meriden, Conn. The supply of good clay is sufficient to meet the greatest demands for years to come. Mr. Frank C. Whitney, formerly the genial bookkeeper for M. E. Jacobs, is to manage the new concern, and under his skilful hand, with the aid of improved machinery, this yard should, and probably will, turn out a fine quality of brick. It is his intention to take up all the branches of the business, and, when fully started, expects to turn out eight to ten million brick annually.

THE NEW BRITAIN ARCHITECTURAL TERRA-COTTA COMPANY are being pushed with orders, and report trade good.

M. J. DONNELLY BRICK COMPANY are, as usual, under full swing, and are trying hard to keep up their reputation as the busiest concern in Berlin.

THE YALE BRICK COMPANY are about to burn a kiln of pressed brick, made from dry pressed shale rock. This is quite a novelty in the pressed brick line, as it was formerly thought impossible to make them from shale alone, without the addition of clay. The color is rich mahogany.

M. E. JACOBS is furnishing brick for the new Orphan Asylum in Meriden, Conn., and has the usual force of help employed.

THE Central Press Brick Company have recently made a change in the location of their Chicago office, and may now be found in the Medinah Temple, Room 809, 185 Jackson Street. Mr. Charles T. Harris has assumed the management of this office, and will be only too glad to submit samples and make prices on any goods manufactured by his company. The new catalogue which they have recently issued gives some of the latest results in shapes secured by them, to which they invite attention. The high standing of the goods made by the Central Pressed Brick Company is by far too well known to need any further mention. We congratulate Mr. Harris on having such a fine line to handle, and wish him the best of success.

A NEW hydraulic company, called the New York Hydraulic Press Brick Company, is now being built at Canandaigua, N. Y. E. C. Sterling of St. Louis, president; H. W. Eliot of St. Louis, secretary and treasurer.

This is one of the numerous branch companies of the old original Hydraulic Press, Brick Company of St. Louis, and they will make red, buff, and various kinds of mottled brick. Capacity will be on the start 5,000,000 front brick per annum.

THERE is plenty of clay in the New England States, and plenty of capital to invest in a manufacturing business that has a certain and profitable future in it. The Clay Shingle Company would like to see at least two factories started in these States, with the exclusive right to manufacture their roofing tile. See advertisement in another page. They will be glad to furnish information to parties with idle clays and idle capital.

Miscellaneous.

WE are glad to call attention to the last edition of Hendricks' Architects' and Builders' Guide and Contractors' Directory of America. It is a volume worthy of high praise, since it covers very completely and correctly the class that come within its field. There has been need of such a volume that was authentic and up to date. Our own considerable experience and acquaintance in this direction would lead us to pick the flaws quite readily in such a work of reference if they were there. We have found it all that it should be in this respect. In construction and arrangement considerable attention has been evidently bestowed, and one or two special features introduced that are very desirable. We would advise any parties using such works to obtain one of these volumes.

DON'T put too low a figure on your goods; sales are not profitable unless there is something to be realized on the cost of production. Good work at a fair price is a maxim that generally brings success. We insert the following letter which bears upon this subject with a moral that is obvious : —

MR. I. P. FRINK, 551 Pearl St., New York.

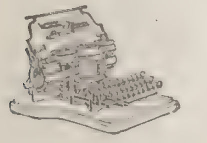
Dear Sir, — Four concerns figured on lighting our church. Your estimate was the highest. We investigated them all. The committee was of the opinion that it was better to pay a little more and know what we would get than to pay less and take chances. The fixtures are now all in and are just right. Everybody is pleased with them. We don't know but what some of the other parties might have done as well for a little less money, but we believe in reputation, and that the man who has been in business the longest and has done the greatest business gives more for the money, and that the man who under-figures makes it up at the expense of the customer.

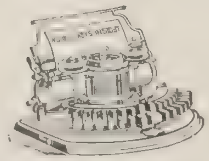
Sincerely yours,
WM. J. COOPER, Secretary.
By Order of the Board of Trustees First Presbyterian Church, Asbury Park, N. J.

AMONG the recent notable buildings in which the Morse Patent Steel Wall Ties are used is the Lincoln Park Palace, Chicago, Lauderdale Building, Providence, Woman's Reformatory, Bedford, N. Y. Architects and contractors are invited to write for samples and information to

J. B. PRESCOTT & SON,
Manufacturers, Webster, Mass.

GENERAL MANAGER TERRY of the Powhatan Clay Co., Richmond, Va., is out for business. On a recent trip East the following agencies were established: W. H. Gates, 30 Kilby Street, Boston; Pfotenhauer & Nesbit, Metropolitan Bldg., New York; and E. A. Keeling, 808 F Street, Washington.





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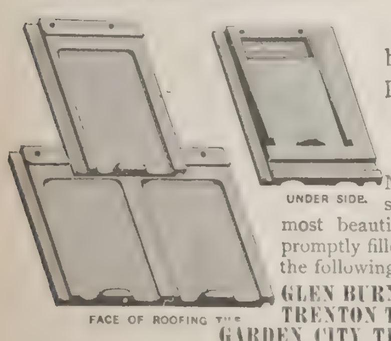

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THE BRICKBUILDER

Vol. III. BOSTON, AUGUST, 1894. No. 8.

BRICK AND MARBLE IN THE MIDDLE AGES.

CHAPTER VI.—Continued.

AND now that we have visited two of the great churches, we must no longer delay our visit to the church of Sta. Maria l'Antica, whose small burial ground is fenced from the busy thoroughfares, which on two sides bound it, by an iron railing of most exquisite design, divided at intervals by piers of stone, on whose summits stand gazing upward as in prayer, or downwards as in warning to those who pass below, a beautiful series of saintly figures. Within, a glorious assemblage of monuments meets the eye — one over the entrance doorway, the others either towering up in picturesque confusion above the railing, which has been their guardian from all damage for so many centuries, or meekly hiding their humility behind the larger masses of their companions.

The monuments are all to the members of one family — the Scaligeri — who rose to power in the thirteenth century, and held sway in Verona until almost the end of the fourteenth. In this space of time, it was, therefore, that these monuments were erected, and they are consequently of singular interest, not only for the excessive beauty of the group of marble and stone which, in the busiest highway of the city, among tall houses and crowds of people, has made this churchyard, for some five hundred years, the central point of architectural interest, but because they give us dated examples of the best pointed work during nearly the whole time of its prevalence in Verona. In the monument of the first Duke we see the elements of that beauty which, after ascending to perfection in that of another, again descends surely and certainly in the monument of Can Signorio, the largest and most elaborate of all, and, therefore, I am afraid, the most commonly admired, but the one which shows most evidence of the rise of the Renaissance spirit, and the fall of true art. Nor is it, I think, to be forgotten, as an evidence of the kind of moral turpitude which so often precedes or accompanies the fall of art, that this Can Signorio first murdered his own brother, Cangrande II., that he might obtain his inheritance, and then, before he died, erected his own monument, and adorned it with effigies of SS. Quirinus, Valentine, Martin, George, Sigismund, and Louis, together with allegorical figures of the Virtues with whom he, of all men, had least right to associate himself in death, when in life he had ever despised them. The inscription, which records the name of the architect on this monument, does but record the vanity of him who was content thus to pander to the wretched Can Signorio's desire to excuse the memory of his autrocious life by the sight of an immense cenotaph.[1]

The tomb of Cangrande I. forms the portal of the church, as well as the monument of the first and greatest of the family. It is, perhaps, altogether, the finest of all; the shafts which bear the pyramidal canopy are supported on corbels; between them is a simple sarcophagus sculptured with a bas-relief, and upon it lies Cangrande with his arms crossed in token of his resignation and faith. At the top of the pyramidal covering is the figure of the brave knight riding forth to war on his gayly caparisoned steed.

Next to this monument in date, as in merit, is that of Mastino II., wanting, perhaps, in some of the severe simplicity of the other, but even more striking, as it stands at the angle of the cemetery. It is a thoroughbly grand and noble erection of two stages in height, the lower unimportant, and only serving as a means of raising the monument sufficiently high to be well seen from the exterior; upon this stand four shafts, between which, and supported upon four much smaller shafts, is the sarcophagus, on which lies the recumbent effigy, at whose head stand angels with expanded wings[1] guarding the deceased. The sarcophagus is adorned with bas-reliefs — that on the west side being the Crucifixion — and has engaged angle shafts. The four main bearing shafts at the angles of the monument have finely carved caps with square abaci, from which rise simple trefoiled arches, with steep pediments on each side filled with sculpture in relief, and between these are exquisitely simple niches, each a miniature reproduction of the entire monument, and containing between their delicate detached shafts figures of saints. The whole is finished with a heavy pyramidal capping, crocketed at the angles with crockets so abominable in their shape and carving that they go far to spoil the entire work, and surmounted by the figure of the Capitano del Popolo, spear in hand, riding on his war-horse; the horse and horseman riding with their faces towards the setting sun, as all in life must ever ride; the effigy below lying so that at the last day the beams of the day-star in the East may first meet its view, and awaken him that sleepeth here in peace.

This contrary position of the figure in life and in death, observed also in others of these monuments, is an evidence of the care and thoughtfulness with which every detail of these noble works was wrought out.

The monument of Can Signorio is not worthy of so long a description; it is octagonal in its plan, and in many respects below the idea shadowed out so beautifully in the others; the reduplication of niches and gables, far from improving, only perplexes the design: and when to this is added that the carving throughout, as well as the other details, show strong signs of a leaning towards Renaissance, one may see some reason why this, the most elaborate and complicated of all the monuments, is, after all, far from being the most successful.

Mastino II. died in the year 1351, and we may therefore, I think, look upon his monument as a fair enough example of Italian architecture just at the period at which in England it had reached its culminating point, and a careful examination of it cannot, therefore, be thrown away. In the first place, I must notice that the sculpture, which has the air of being rather sparingly used as too sacred a thing to be idly or profusely employed, is exceedingly good. The foliage is almost always very closely copied from natural forms, is very thin and delicate in its texture, and thus really presents to the gazer that idealized petrifaction of nature which it ought always to be the sculptor's effort to give, and not, as is, I fear, sometimes the case, even in good English work, so profusely scattered over the whole surface as to give one a sense of its lack of great value. The worst part of the carving is, as I have before said, that of the crockets, which are as bad as the worst modern Gothic could be. The sculpture of the human figure is throughout very good; remarkable for simple, bold, deep folds in the draperies, quite Gothic in spirit, and much more akin to our best fourteenth-century work than to any classic examples.

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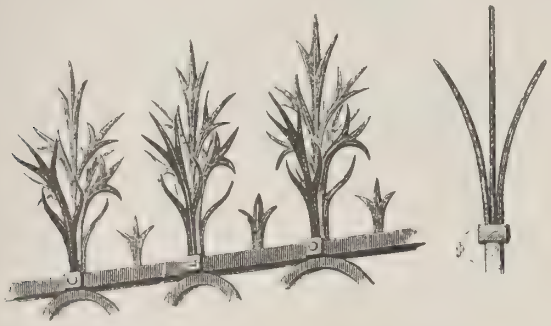
[1] It is not a little remarkable that this should be the monument a copy of which the late Duke of Brunswick desired in his will to have erected over his grave.

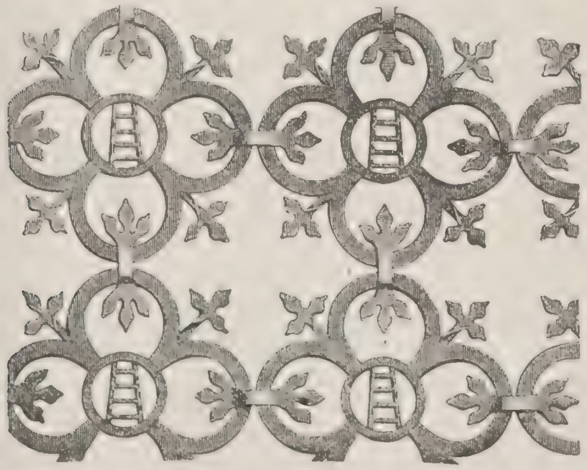
[1] The wings of these angels are of metal, though the figures themselves are marble.



CREST OF METAL RAILING, VERONA.

As an example of the science of moulding this work is, however, valueless; there is absolutely no moulding upon it; and why should there be? Would it have been well that the lovely marble, whose brilliant white gloss was sure erelong to be stained with dark streaks of black by the beating of rain and the staining of age, whilst here and there the white would stand out more brilliantly than ever, — would it have been well, I say, that this should have been still further streaked with deep lines of many mouldings? Most assuredly not: the architect had to deal with a material which best takes its polish and exhibits its beauty and purity when used in flat surfaces and in shallow carving, and he did right therefore in not moulding it as he would have moulded stone.

There is a sharpness and hardness about the lines of the arches, however, which perhaps almost verges upon rudeness, and though I can see that it may be fairly defended, I could yet wish that it might have been softened.

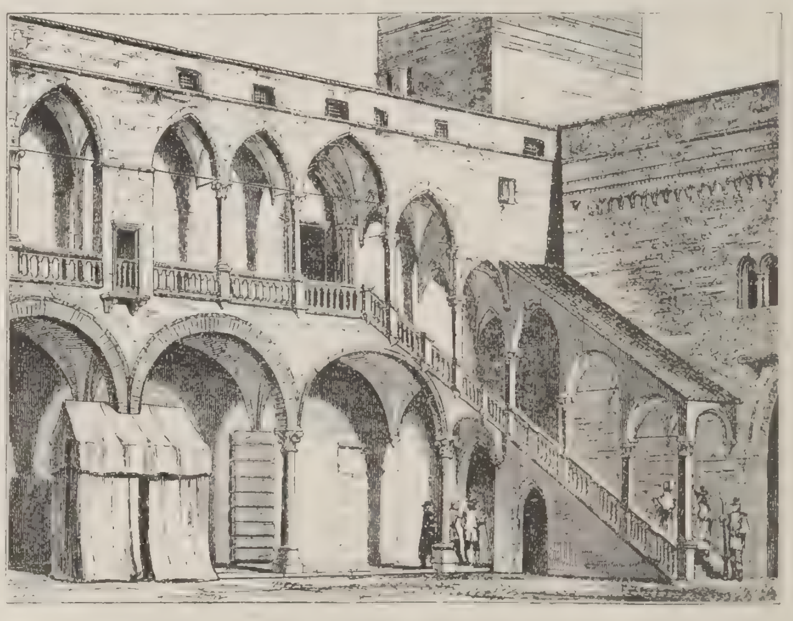


METAL RAILING, VERONA.

But the points in which such work is a grand example to us are, first, the value which it shows that we ought to place upon the simple detached circular shaft, and, next, the beauty and strength of effect which the cusping of a large arch in a proper manner gives. In these two points this monument and most of its class teach us lessons which we ought not to be unwilling to learn, and which, if we at all wish to develop beyond the point at which our own ancestors ever arrived, we must not fail to attend to in our own work.

And now I must bid farewell to this lovely spot, the most attractive certainly, to me, in Verona. The situation of the monuments rather huddled together, with the old church behind them, the archway into the Piazza dei Signori on the other side, and the beautiful iron grille[1] which surrounds them, the number of saintly and warlike figures, and the confused mass of pinnacle and shaft, half obscured by the railing, do, I verily believe, make the cemetery of Sta. Maria l'Antica one of the best spots in the world for the study of Christian art in perfection. What either Köln or Regensburg Cathedral, or the Wiesen-Kirche at Söest is to Germany, the Choir of Westminster Abbey or the Chapter-House at Southwell to England, Amiens Cathedral or the Sainte Chapelle of Paris to France, such is the cemetery of the Scaligeri in Verona to Italy — the spot where, at a glance, the whole essence of the system of a school of artists may be comprehended, lavished on a small but most stately effort of their genius.

Close to their burial place stands also the Palace of the Scaligers. The old portion of this fronts towards the Piazza dei Signori, a small square used only by foot passengers, and surrounded by elaborate Renaissance work. The buildings surround a quadrangle — the Mercato Vecchio — out of one angle of which rises the immense campanile which I have already noticed, and which is said to have been erected by Can Signorio about A. D. 1368, though I should have thought that a rather earlier date would have tallied better with its style. Besides this the most striking feature is the external staircase in the courtyard, whose treatment, of a kind not uncommon in ancient Italian architecture, is very beautiful, though I fear very weak and unstable, if I may judge by the number of the iron bars by which it is held together. There are many windows here of very good detail, and an arcaded cornice all round the courtyard, and close by and also facing the Piazza dei Signori there is another fine lofty battlemented tower.



COURTYARD OF THE PALAZZO SCALIGERI, VERONA.

In a street close to the monuments of the Scaligers, whose name I have forgotten, but in a line with the Viccolo Cavaletto, I found a most valuable example of domestic work in a very fairly perfect state. As far as I could make it out, it consisted originally of three sides of a qualrangle, the fourth side towards the street being enclosed by a wall and arched gateway. The buildings all had arcades on the ground level, forming a kind of cloister, and the staircase to the first floor was external, and built against the wall on the road side. A

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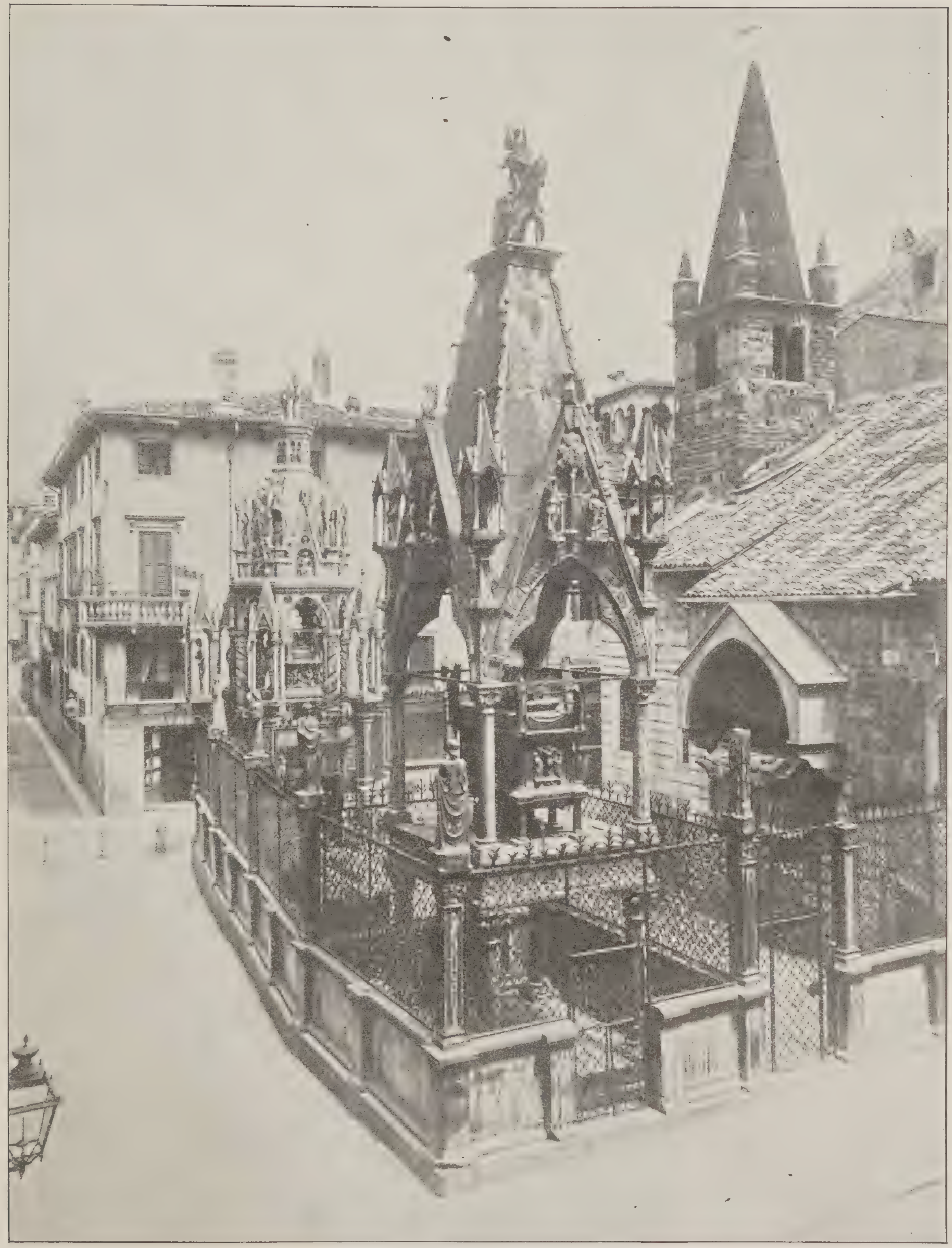
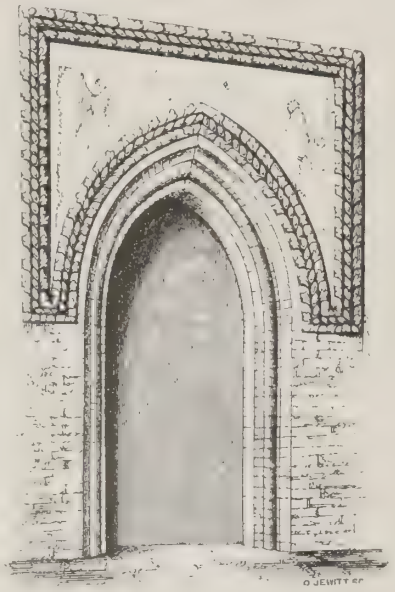
[1] This grille is worthy of special notice. Instead of being hard and stiff, it is all linked together, so that it is more like a piece of chain mail than of iron railing. Its intricacy adds manifold to the effect of the group of tombs which it half conceals.



MONUMENT OF MASTINO II., VERONA.

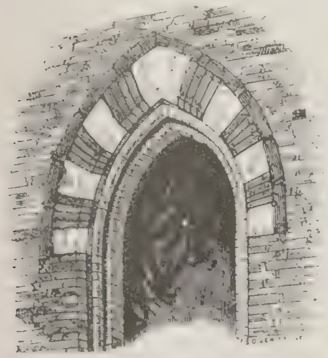
Supplementary Illustration to "Brick and Marble in the Middle Ages."

great many alterations have been made in the house at various times, but in the sketch which I give I have shown so much only of it as appeared to belong to the original foundation. In its construction pointed and round arches have been used quite indiscriminately, and in some of the arches the depth of the voussoirs increases towards the centre of the arch. This is a rather favorite Italian device, and I was always as much pleased as at the first with the effect of strength and good proportion which it produces. Most of the arches are built with alternate voussoirs of brick and stone, but beyond the outside line of the brick and stone arch there is invariably a line of very thin bricks laid all round the arch, delicately defining without pretending to strengthen the main arch, just as a label does with us. I noticed too, generally, that this thin brick was of a deeper, better color than the other bricks, which are seldom any better than the common English bricks, and are always built with very coarse joints. This house is finished at the top with the quaint forked or swallowtailed Ghibelline battlement, so characteristic of Verona, and which, as we found afterwards, was in use at Mantua, Cremona, and for some distance south of Verona, but which I first met with in Verona.



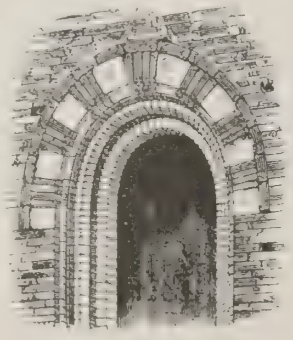
DOORWAY, OLD HOUSE, VERONA.

I am not pretending to journalize regularly, but rather to note down the remarkable points of the various buildings as they occur to me, and, before I forget that it was Sunday when I was first looking at the Veronese churches, I must mention that in the evening we found our way to the great Piazza di Brà, surrounded by barracks and public buildings, and containing the vast Roman amphitheatre for which Verona is so celebrated. Its size is prodigious, and, except in the outer circuit of wall, it is nearly perfect; indeed, it is impossible to look upon such a vast structure without a great admiration for the men who ventured to conceive and carry it into execution.

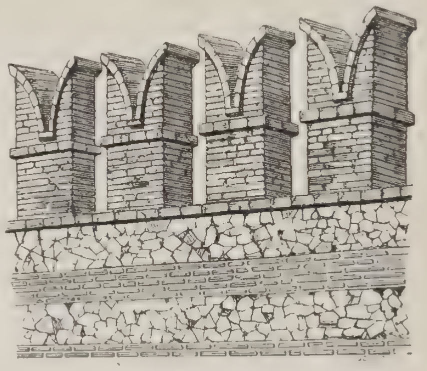


WINDOW, VERONA.

It is difficult now to conceive how the audience could be found who would fill so vast a space; and certainly the modern efforts in this direction are mainly serviceable as showing the immensity of the theatre. When I was last in Verona a theatre had been erected in the arena, and a performance was in progress. The audience might have been tolerably large in an enclosed theatre, but here it seemed to be the merest handful; and when we stood on the highest attainable part of the walls, we found ourselves so far from the stage as to be unable to hear a single word that was said. There is no need to describe here so well-known a building as this; suffice it to say that though the detail of the architecture is poor, the general design and execution of the structural arrangements and the magnificence of the whole scheme cannot fail to strike one with the same wonder that one feels in the presence of many of thsee great Roman works; and it is striking indeed to see one of them so perfect as to be still capable of use, and really used.

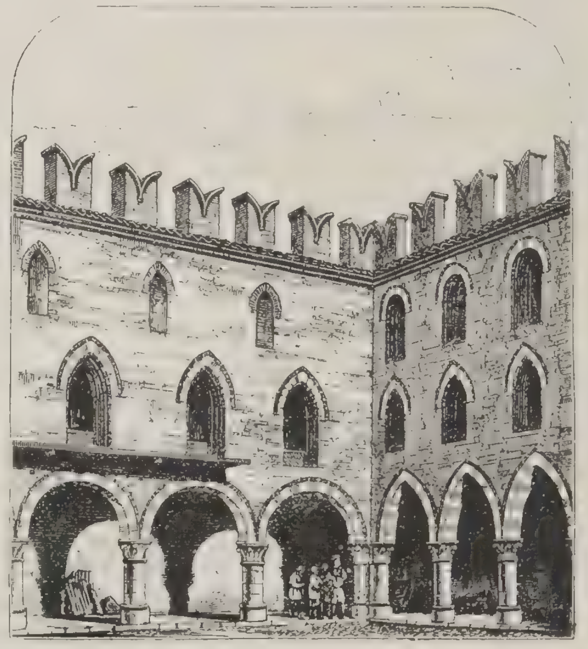


WINDOW, VERONA.



VICCOLO CAVALETTO, VERONA.

All the Austrian portion of the inhabitants of Verona crowded the Piazza di Brà on Sunday evening to hear an Austrian military band, and we enjoyed not a little a stroll among a crowd of uniforms of all shapes, kinds, and colors. Verona more than most towns, even in Austrian Lombardy, seems to be sacrificed entirely to Austrian soldiery. It is quite melancholy to walk along a street of palaces, some of them converted into old-furniture stores, others going to ruin; and when suddenly you do come upon a flourishing and smart palace, if you look in you are sure to see an Austrian sentinel, and find that it is an officer's quarters; and equally when you meet a conveyance, if it is smart and dashing, with good horses and a stylish coachman, it is quite certain to be occupied by some dignified looking military man. So, too, on the Monday evening, when we went to the French opera (a very pretty, tastefully got-up theatre by the way), there were absolutely none but Austrians in the house,— in the boxes, officers and their wives; in the pit, subordinate officers and privates. Who can see this immense staff of foreigners in occupation of a city like Verona without feeling sadly for the people who live under such a rule, and for the ruler who is compelled to maintain such a force to keep his subjects in order? [1]



COURTYARD OF OLD HOUSE, VERONA.

This, however, is a digression, and I must go on to describe the remaining architectural features of the old city.

On the way to San Zenone Maggiore, which is quite on the extreme western verge of the city, one passes the Castello Vecchio, a very grand pile of simple mediæval fortifications erected in the four-

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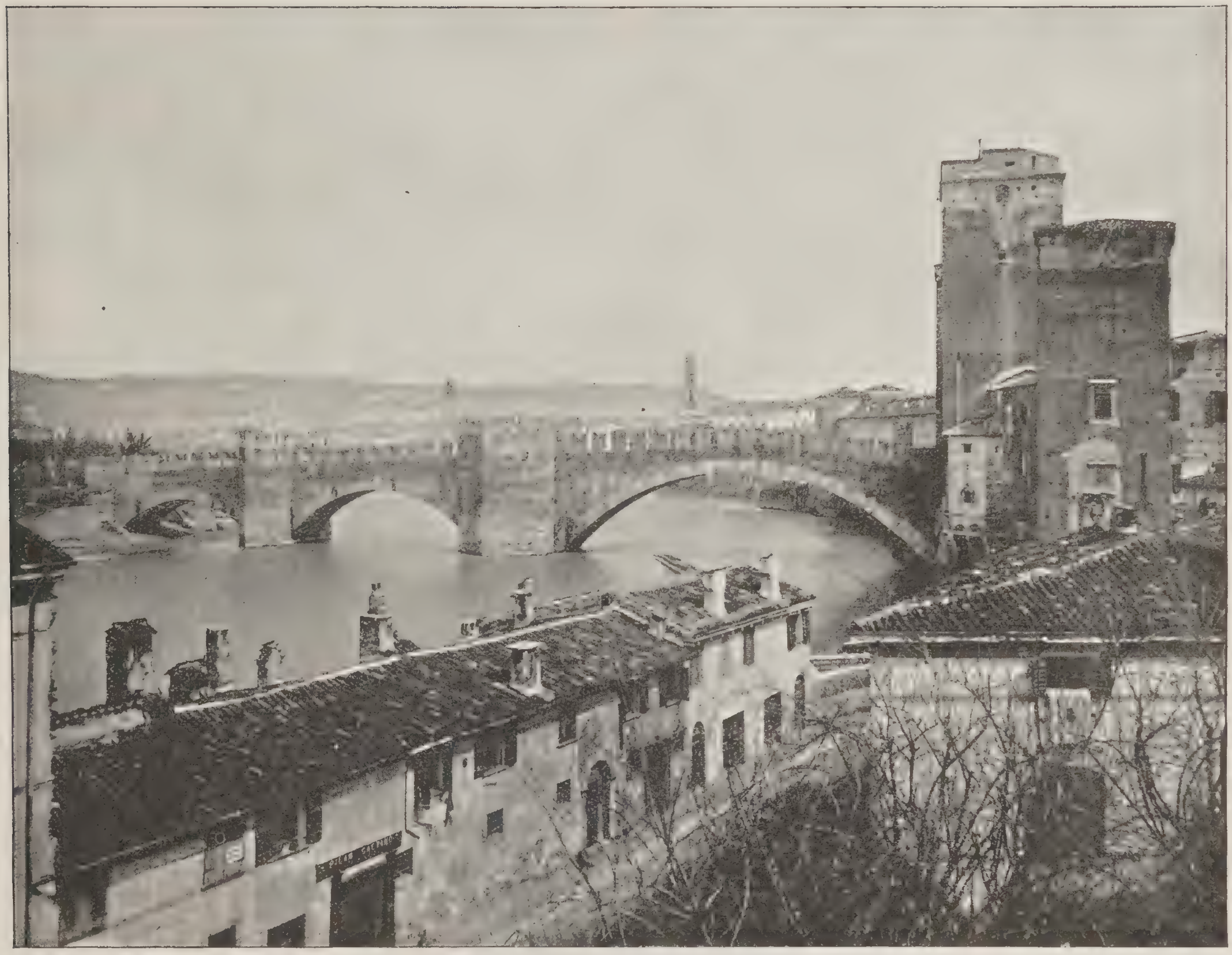
[1] I need hardly say that all this is changed, and I hope changed for the better. The city looks more thriving than it did, and more of the old mansions are properly occupied than was the case in the time of the Austrians.

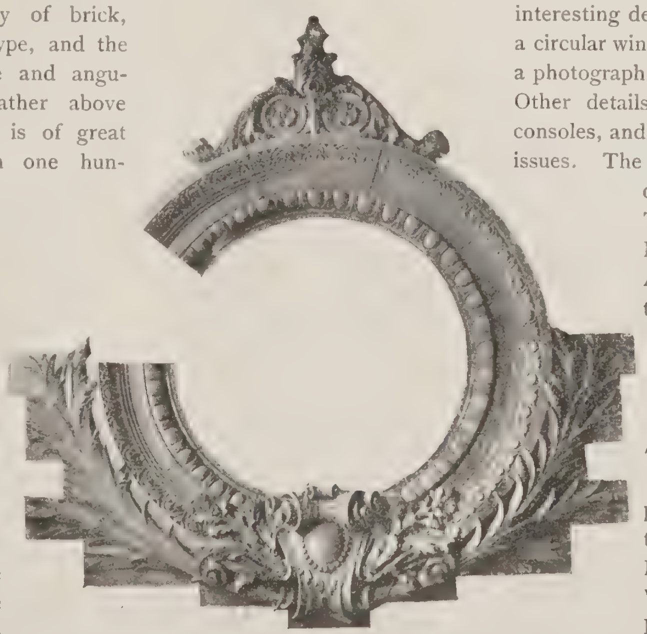


PONTE DI CASTEL-VECCHIO, VERONA.
SUPPLEMENTARY ILLUSTRATION TO "BRICK AND MARBLE IN THE MIDDLE AGES."

teenth century by Cangrande II. There are several towers and lofty walls, all topped with the forked Veronese battlement; and connected with it is the magnificent Ponte di Castel-Vecchio, a great bridge across the rushing Adige, built entirely of brick, the parapet of the regular Veronese type, and the piers between the arches rather large and angular, and finishing with battlements rather above those of the bridge. The main arch is of great size,— it is said to be not less than one hundred and sixty feet,— and one of the most remarkable points in its appearance is that, instead of being in the centre, it is on the side of the river next the castle, while the other two arches, descending rapidly to the north bank of the river, give the bridge an odd, irregular, and down-hill kind of look. The architectural features of this bridge are, however, not the only objects of interest on this spot; for just after passing the castle the road bends down to the side of the river, and presents an admirable view of the campanili, steeples, and spires, with the steep hills on the opposite bank of the stream, and the mountains in the distance, with the rapid, turgid, white-looking Adige flowing strongly at one's feet.

(*To be continued.*)

CIRCULAR TERRA-COTTA WINDOW.



THE Carnegie Music Hall, on the corner of Fifty-Seventh Street and Seventh Avenue, New York City, contains a great deal of interesting detail in terra-cotta, one example of which, a circular window in the tower, is here published from a photograph of the terra-cotta set up at the works. Other details, comprising capitals, panels, brackets, consoles, and pilasters, will be published in subsequent issues. The terra-cotta, which is a pleasing shade of dark buff, was executed by the Excelsior Terra-Cotta Company of New York City. Mr. William B. Tuthill, 287 Fourth Avenue, New York, is the architect of the building.

A CARD OF ACKNOWLEDGMENT.

THE editor of THE BRICKBUILDER has been greatly assisted in securing photographs to supplement the illustrations of "Brick and Marble in the Middle Ages," by Messrs. H. Langford Warren, Clarence H. Blackall, William Martin Aiken, Walter F. Price, Charles H. Muhlenberg, James C. Green, and Lyman A. Ford, who have opened their collections of photographs to him, and made it possible to very fully illustrate the buildings described in Mr. Street's book.

THE ART OF BUILDING AMONG THE ROMANS.

Translated from the French of Auguste Choisy by

Arthur J. Dillon.

CHAPTER II. — Continued.

THE first several plates published with this treatise show the general appearance of the different parts of the frameworks of the vaults imbedded in the masonry they held up, and the sketches scattered through the text give more exact details of their construction. In general, one can readily understand their nature and the importance of their rôle. I have chosen from among the many different kinds of armatures a simple type, and have endeavored in the following drawing to show the aspect of the work while in process of building.

In the figure one can see the temporary centring, C D, a light framework of brick, bearing directly on the centring, and the masses of rubble, M, which, when finished, form the real vault. In the modern system of building the temporary centring, C, would support the entire vault and have to be capable of great resistance, and hence would be very expensive. Here, on the contrary, the wooden centrings support only the skeleton of the vault, D, an important difference, for it allows the resisting force of the centring to be reduced in proportion to the weight supported, that is to say, it permits a noticeabe reduction of strength, and, therefore, of expense.

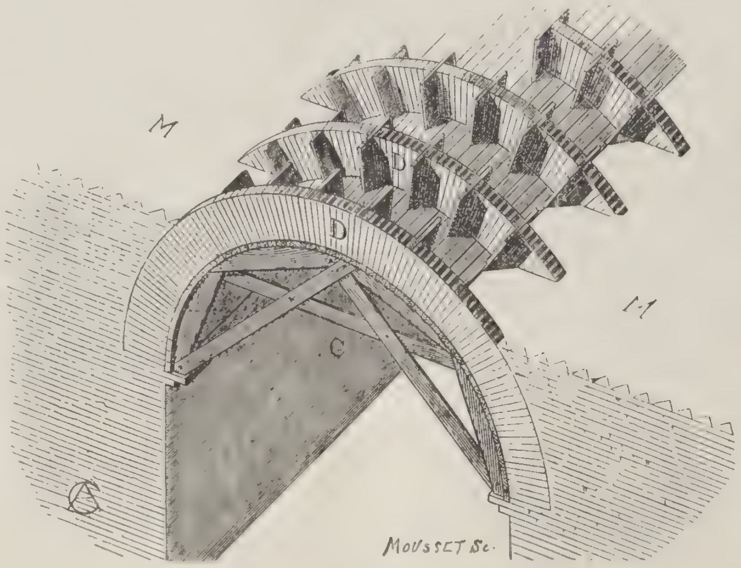


Fig. 13.

Re-enforced with the resisting lattice of brick which covered it, the temporary centring, C, was protected from any destructive action; it imparted its form to the rubble without supporting it, for, once it was in place, the brick armature became the real centring of the vault, and an essentially durable one, which remained in the body of the rubble, incorporated with it, and contributing as much as the rough masonry toward the solidity and preservation of the structure.

It is true that this second centring of brick imbedded in the masonry cost more than the amount of rubble of which it took the place; but this increase of cost was extremely small compared with the amount economized in the temporary scaffolding, and, moreover, the increase was, in itself, very insignificant.

The material of which the armatures were made was simply brick, of large dimensions, it is true, but of a manufacture which cost very little near Rome. Nevertheless, they were used very sparingly; instead of making the revetments which re-enforced and strengthened the centrings continuous, we saw that the Romans reduced it to an open network, doing away with almost half the bricks which would have been necessary to form a solid envelope to the centrings (Plate I.).

Frequently they limited themselves to isolated ribs, to transverse arches buried in the thickness of the masonry (Plates II., III., VII., VIII., IX., X., XI.).[1] Even these transverse arches are not made of solid masonry, but are hollowed in every way until they are but narrow networks of brick spaced along the vaults.

Finally, in certain cases, to diminish the expense caused by the thickness of a vault of bricks laid on end, the Romans made armatures of bricks laid flat, which formed a kind of curved tiling over the centrings (Plate IV., Fig. 1). Sometimes two layers of this sort were placed one over the other, but the second was usually not continuous, and it would seem impossible to have a more economical arrangement (Plate IV., Fig. 3).

The cost of labor was even less than one would be led to expect by the ingenious, and, in some cases, studied combinations indicated by the drawings; everything was done in the most rapid, one might say, in the rudest manner possible. Before a Roman monument, one feels that ancient workmen learnt by practice to put up the brickwork of vaults offhand, saving all the time and pains compatible with the nature of the work. The appearance of these auxiliary works indicates the greatest precipitation; and the incorrectness of form is sometimes such that, in order to give an intelligible idea of the structure, I have been compelled to give in the drawings a regularity to the armatures which an examination of the ruins would, in more than one case, contradict.

Let us be careful, however, of reproaching the Romans with thoughtless negligence. Here to hasten work to such an extent as to make it incorrect was perhaps more a merit than a fault. In the auxiliary works of such building every increase of time which is not absolutely necessary should be regarded as useless, and the crude appearance of their vaults shows that the Roman workmen had a just appreciation of what was suitable. It was sufficient that these brick skeletons be put up strong enough to hold until the masonry was finished, for once it was laid everything was swallowed up, imprisoned in its mass, and after the decoration was applied, the last traces of the supporting network, which might have been seen from underneath, disappeared under a thick coating of plaster. Under these conditions there was no advantage in careful work, the carelessly built Roman armatures sufficed, and more pains taken in their structure would have been a pure loss.

Aside from motives of economy the Romans had an important reason for avoiding delays. In order to explain fully the haste they showed in placing the sustaining works of the vaults, one must take into account the condition of the work-yard at the moment that the auxiliary constructions in brick were about to be put up. The masonry of the uprights was finished, the temporary centring put in place; the architect then found himself in a difficult position; if he continued the construction of the masonry, he was in danger of breaking down the centring; if, on the contrary, he suspended the rough masonry work to take it up when the armature of the vault was finished, he would leave his whole troop of workmen and slaves unoccupied.

The only way to reconcile all conditions was to so hasten the placing of the armature as to have it completed before the masonry exerted any pressure on the centring. If, for example, A B represents the level at which the pressure begins, the moment the masonry reaches that level the arches must all be finished and the work present the appearance of this sketch (Fig. 14).

Armature and masonry, all the work was begun at the same time, but the armature had to be put in place and made ready during the short interval when the rubble of the vault could support itself. Hence the marked precipitation, whose need, one sees, was urgent. It was no less a question than that of temporarily leaving unoccupied all the numerous laborers on whom the Romans imposed the manual and ordinary parts of their great constructions. This first period, during which the entire interior scaffolding had to be raised in the greatest haste, was the only critical one; the vault completed on this inflexible support was completed as easily as an ordinary wall, and when finally came the moment when it should be left to itself, the removal of the centring which, in other systems, is such a delicate operation, was achieved without danger, or, rather, was a fictitious operation. There was no risk incurred in taking down the wooden centrings; the real centring was the armature itself, swallowed up in the midst of the rubble, where it remained and supported the weight of the vault until all the mortar had set.

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[1] Plate I. was published in May, Plates II., III., and IV. in this issue, and the others will appear later. — Ed.

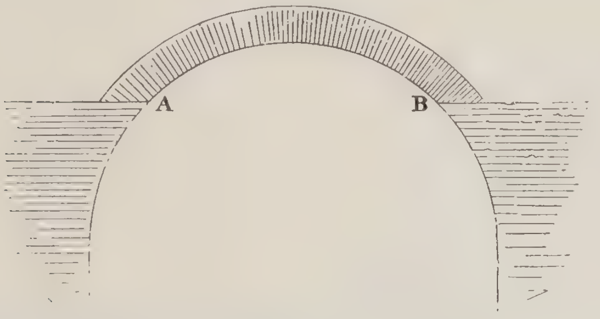


Fig. 14

One can now conceive, as a whole, the successive steps in Roman construction, and see the advantages of the structure of ancient vaults, based, as we have shown on principles, essentially simple and practical. Some of these principles arise so naturally that one finds them under other forms, in architecture, in appearance most different to the Roman. I refer to the French architecture of the Middle Ages. Though the ribbed vaults of our cathedrals resemble Roman vaults neither in appearance nor conditions of equilibrium, the first being maintained by a complicated and scientific combination of thrusts and counter-thrusts, the stability in the others resulting simply from the monolithic form of their masonry, yet in the methods of construction the analogy is striking, the more so, because it is perhaps accidental. Who cannot perceive in the ribs of the vaults of the Middle Ages, the resemblance to ancient armatures? In one case the ribs are made of brick and swallowed up in the masonry, in the other they are in relief and support the panels of cut stone.

But the distinctions of form or material are here of little importance; the fundamental principle is the same in both cases, embedded or projecting; the ribs filled equivalent roles at least during the construction, and the more the external aspects differ the better one can appreciate how natural and general is the building of vaults of a second centring of masonry. It is not my place to foretell the transformations which the ingenious idea will undergo in future; but, at any rate, the various applications made of it by two profoundly different schools of architecture is an assurance of its fecundity, and certainly it would be worth while for builders to examine the resources which similar methods offer in our own day.

In terminating this first study of vaults in the buildings themselves it would be helpful to compare our hypotheses with indications in ancient writings, but unfortunately direct references to the subject are very incomplete, and the few allusions to it are very obscure. Vitruvius often uses the word "vault," but he nowhere enters into the details of their construction; and an analysis of his entire treatise would hardly show a single passage really enlightening us on this question, perhaps the most important in all the history of ancient construction. He dwells at length on the methods of imitating vaults by means of curved frames of wood covered with reeds and plaster, but one seeks in vain for any description of vaults properly so-called. This strange blank may be the result of an omission on the part of the author, or it may be the result of subsequent mutilation of his work; or perhaps be an indication of the state of the art of building at his time. The last is the conjecture to which I most incline, for it must be granted that the date of the most ancient vaults of great size which still exist gives it the appearance of truth.

In spite of the gaps and obscurities in his treatise, Vitruvius always remained an authority among the Romans, and the authors who succeeded him usually contented themselves with reproducing in a less cumbersome and diffuse, and often less exact, form the information in his works. Thus Pliny, who wrote at a time when vaults with armatures were in general use, gives no details of their construction; and the agriculturist, Palladius, as well as an anonymous abbreviator of Vitruvius, keeps the same silence on methods applicable to real vaults, elaborating, as did the author they copied, those constructions of most mediocre importance which imitated the curvature of vaults without giving either their strength or durability. But though the support of writings fails us we can at least invoke that of tradition. The Italians of to-day are most economical of temporary constructions in wood when it is a question of centring for vaults, and it is not rare to find them using such expedients as that shown in Fig. 15. Here the permanent centring of the ancients is replaced by a layer of bricks laid flat, supported by a crosspiece of wood of a poor quality, and a few bricks on end; sometimes the Italians removed with the rest of the centring the course of flat-laid bricks which the Romans ordinarily left in place, but even in modern works I have often found vaults after completion lined with the curved courses which originally served as centres.

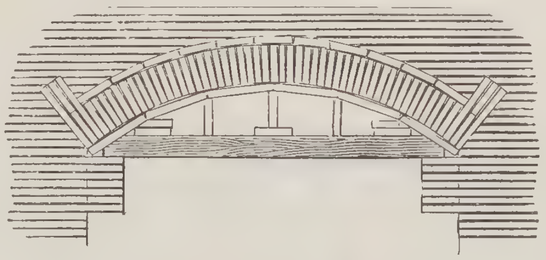


Fig. 15.

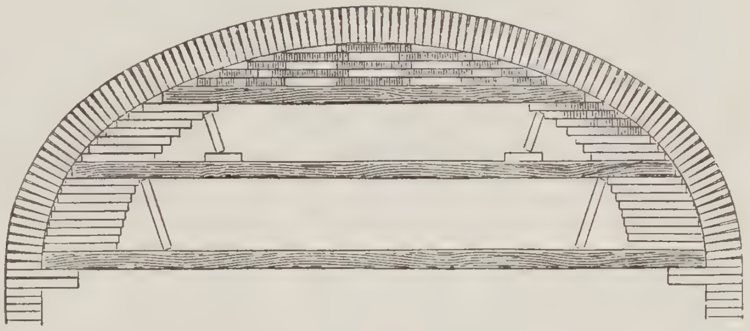


Fig. 16.

Another system of centring of brick conceived in almost the same spirit is shown in Fig. 16. Here the mould for the vault is composed near the springing of two overhanging stacks of brick and near the summit of an open tympanum of bricks carried on a crosspiece of wood.

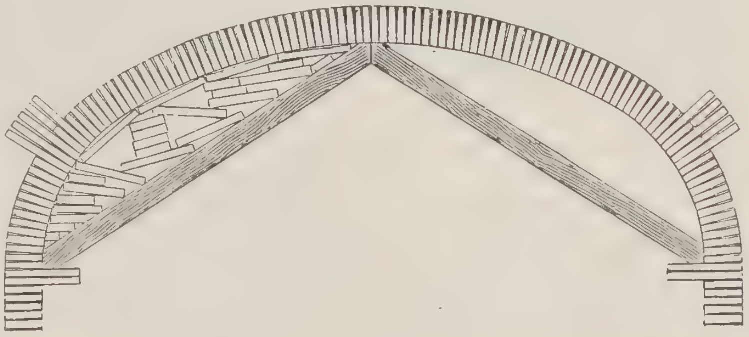
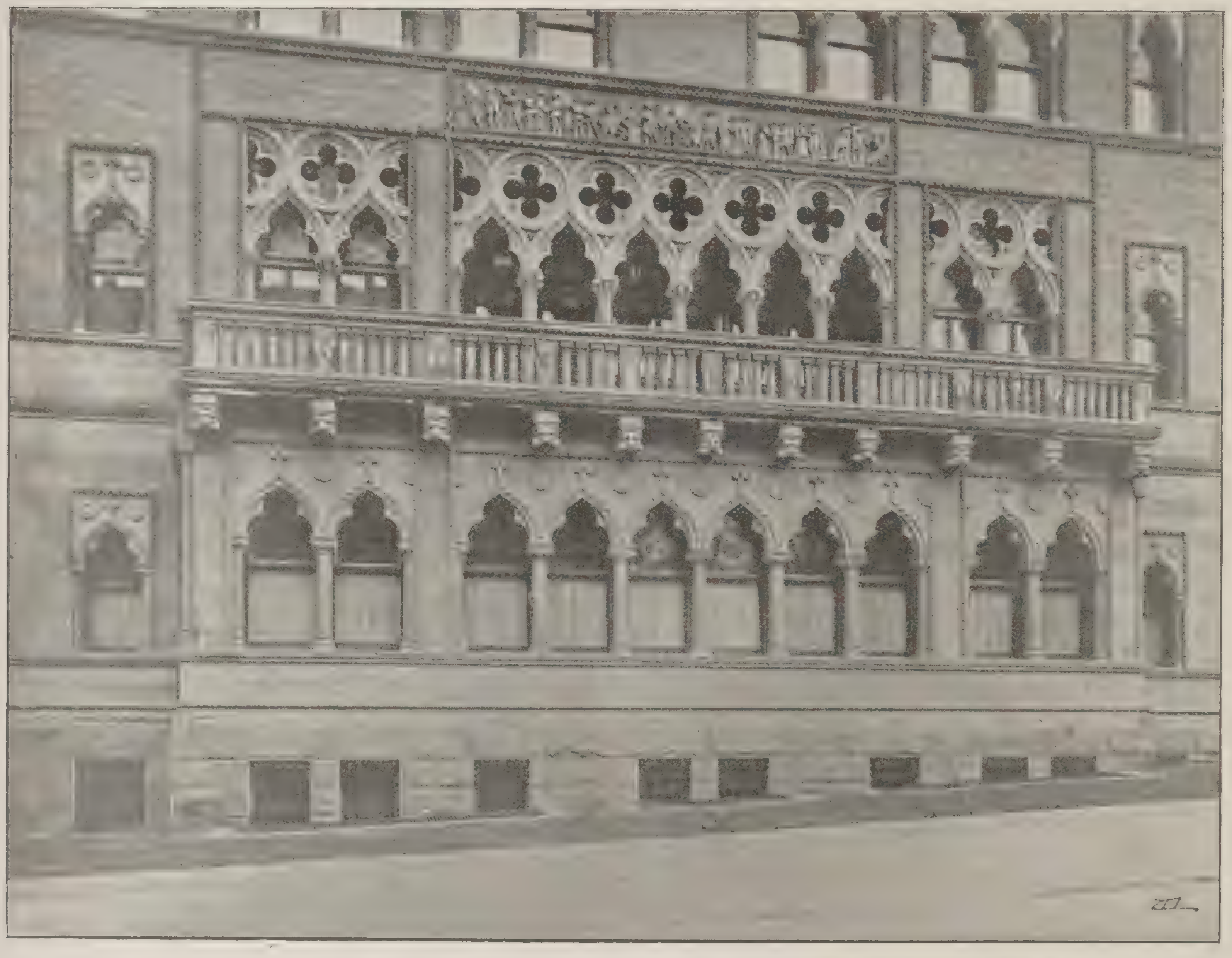


Fig. 17.

Fig. 17 is a last example of this system of centring; it consists of two pieces of wood leaning against each other and carrying a sort of irregularly built tympanum of brick which supports the vault while it is in course of construction.

Probably none of these three types of modern centres correspond exactly with those of antiquity; but it is, I think, impossible not to recognize the remarkable similarity of principles shown, for example, in the tendency to reduce the scaffolding to the greatest simplicity in the important part given to brick in the centrings, and in their use because of economy and lightness in the curved linings and open tympanums. We will often find, in the remainder of this study, other analogies between the construction of former days and that of modern Italy: often the examination of processes now in use will help us to understand those obscurely shown in the Roman ruins, or will at least give further guarantees of the truth of the explanatory hypotheses we must build up. But let us return to the Roman armatures. They are divided, as we have seen, into two groups, one comprehending all the combinations of arches or networks with radiating joints, the other all those made of bricks laid flat: we will take up in turn their employment in the different kinds of vaults, and first of all in barrel-vaults.



DETAIL FROM THE MONTAUK CLUB, BROOKLYN, N. Y.

Terra-Cotta by the New York Architectural Terra-Cotta Co. F. H. Kimball, Architect, 55 Broadway, New York.

(*To be continued.*)

BRICKWORK IN OUR CONTEMPORARIES.

IT is interesting to notice the increase in designs for brick and terra-cotta work published in the several leading journals of architecture, as indicating the strong leaning of architects towards these materials.

The American Architect of July 7 contains a good pen drawing of Chateau St. Agil in France, by W. Campbell, a draughtsman on the *Architect* staff. This *chateau* is a combination of brick, laid in diaper pattern, and cut stone, of a character easily executed in terra-cotta. Although stone work is not in our line, we cannot pass over the charming design of St. Andrew's Church, Detroit, by Cram, Wentworth & Goodhue, shown in this issue, by a double plate of Mr. Goodhue's masterly pen drawings.

The same paper, on July 14, published a drawing by J. C. Halden, also on its staff, of Blackall & Newton's Tremont Temple, in which some very rich terra-cotta detail is shown.

The number for July 21 contains a simple and effective design for a Fire Station by Aaron H. Gould of Somerville, Mass., who has contributed several designs showing a reserved and intelligent handling of brick.

The *Clayworker* has been publishing some very well-selected photographs of French and Flemish brickwork, which ought to give clayworkers pride in their art and its possibilities if nothing else will.

THE MONTAUK CLUB, BROOKLYN.

THE photographs published on this and page 156 are examples of very elaborate terra-cotta work, decidedly Venetian in style, designed by F. H. Kimball of New York, and executed by the New York Architectural Terra-Cotta Company. One of the most interesting features of the Montauk Club in the terra-cotta line is the legendary frieze, a portion of which is shown in the photograph on page 156. The figure work over the windows in the photograph above represents a historical scene in the colonial times of New York.

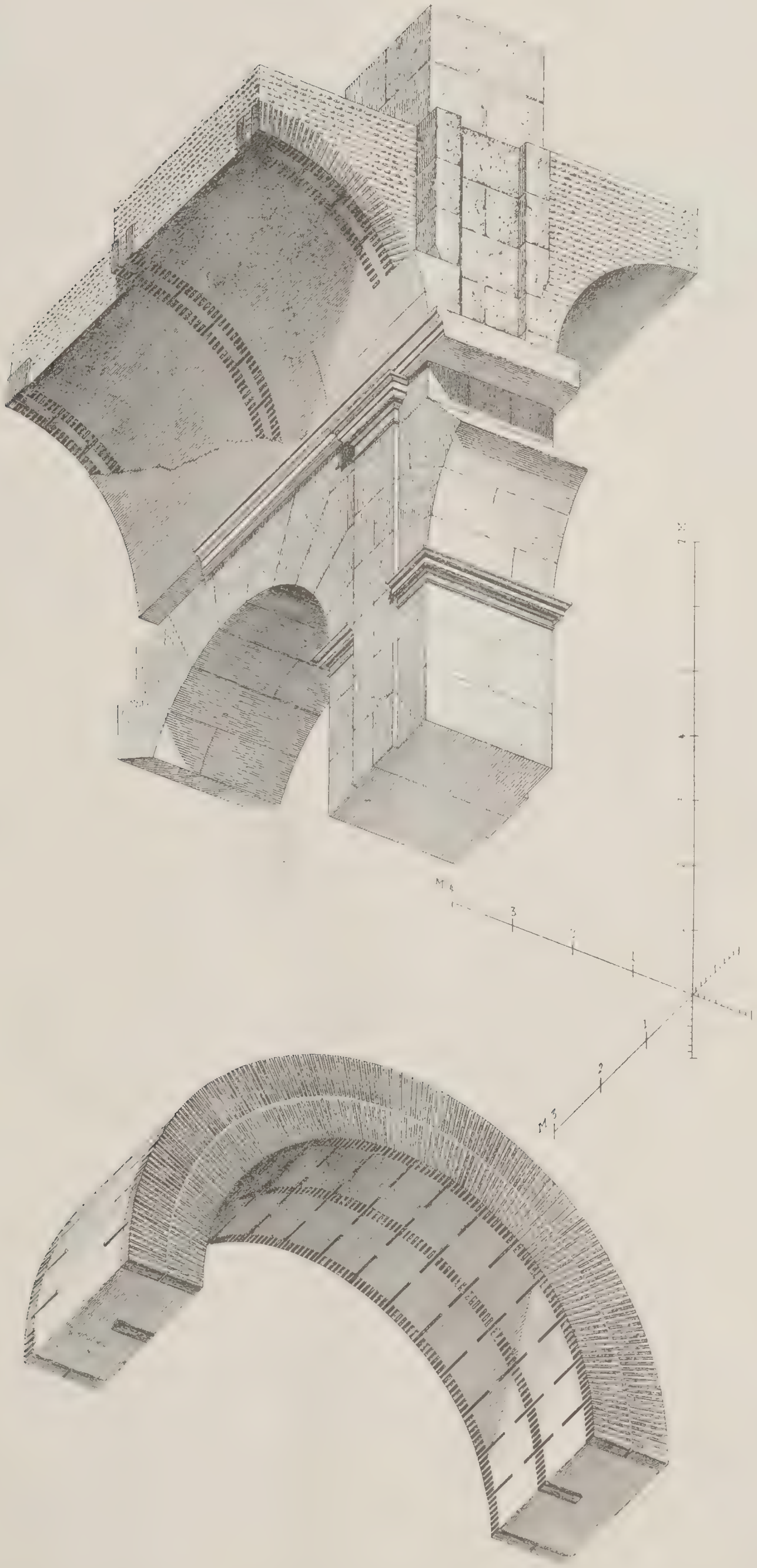


Plate II. THE ART OF BUILDING AMONG THE ROMANS. See Page 152.

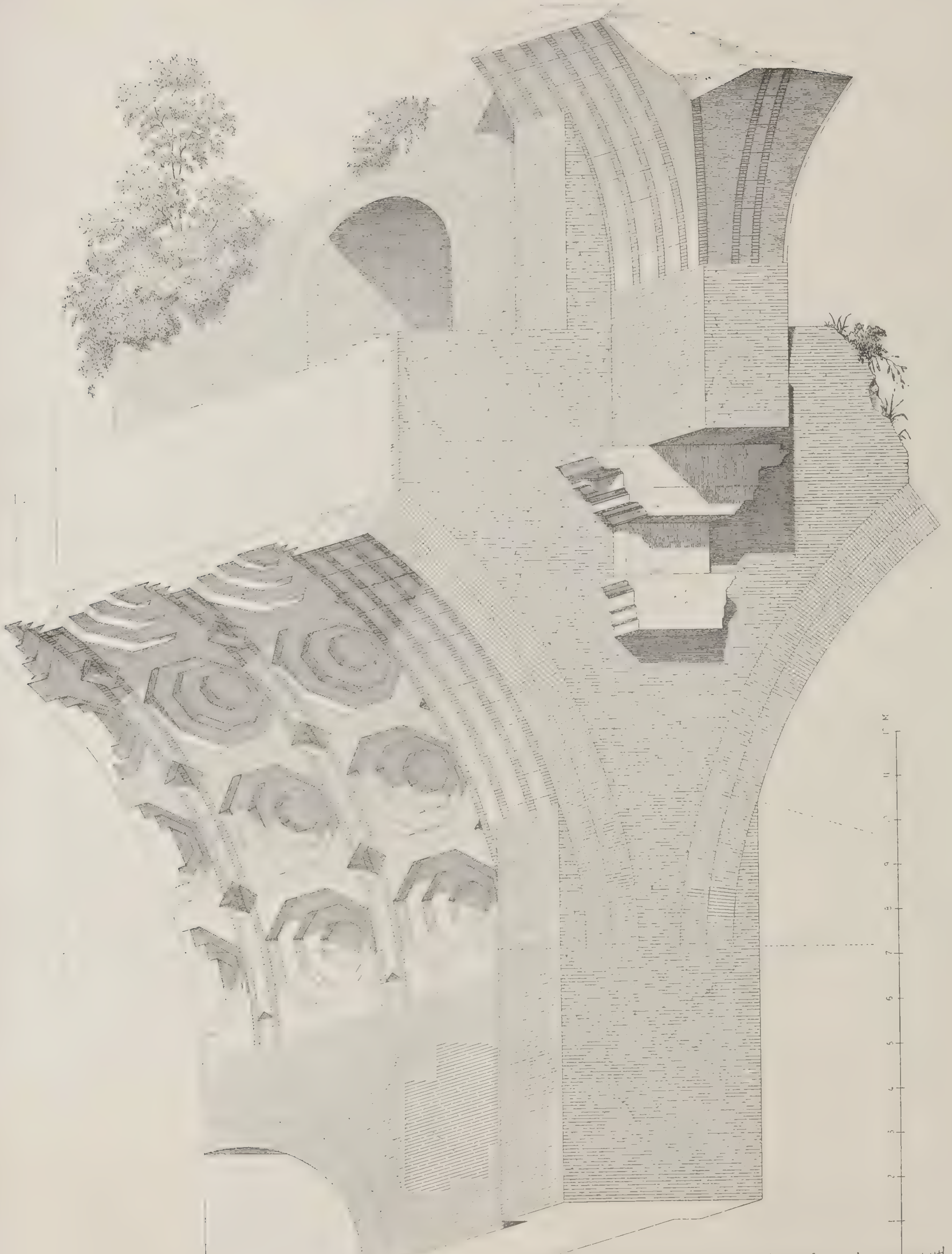
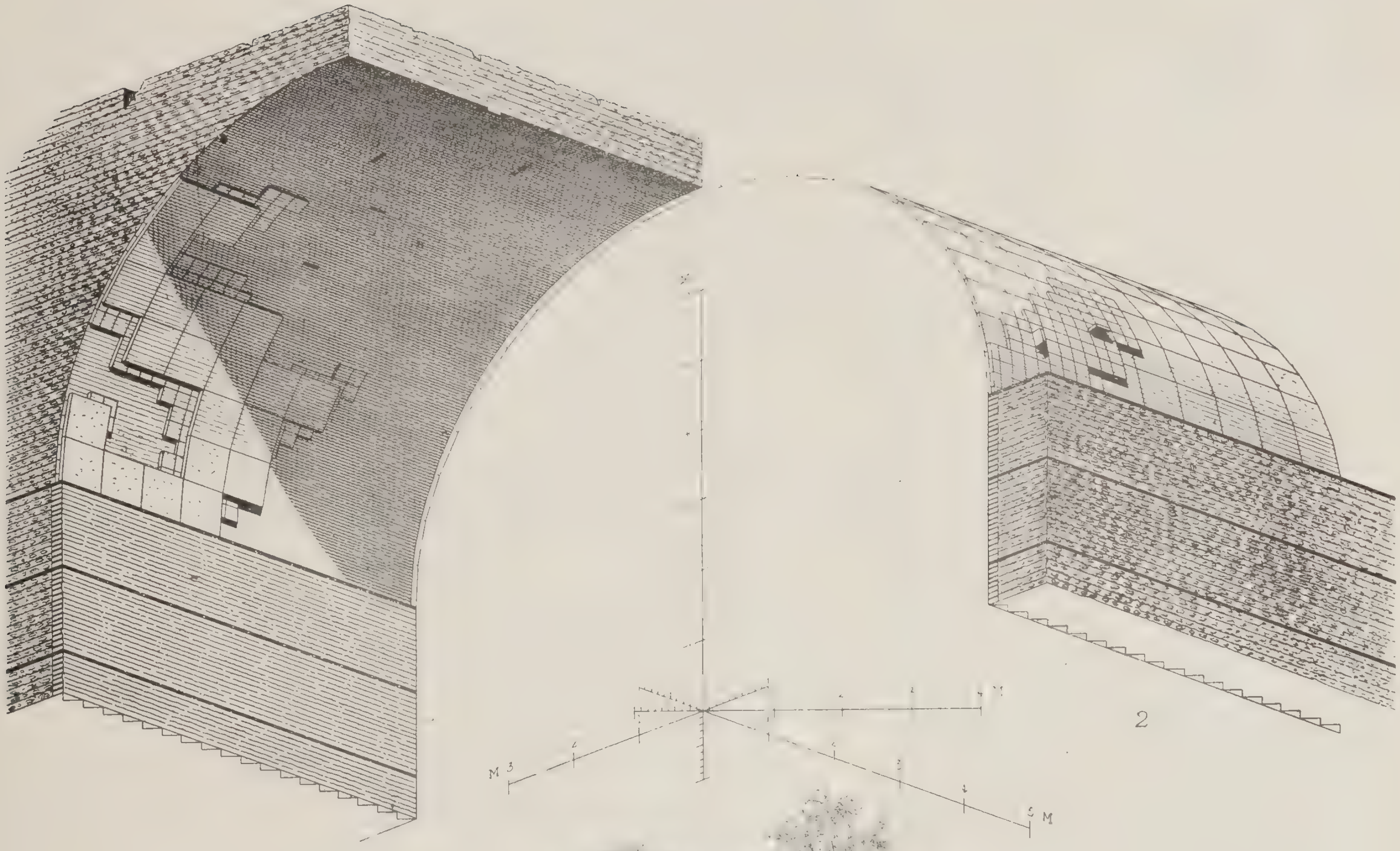
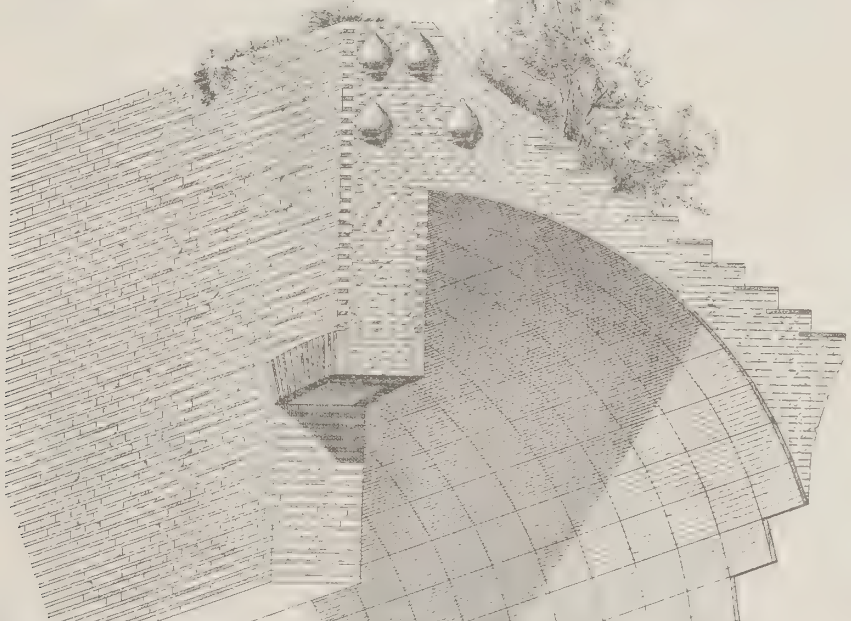
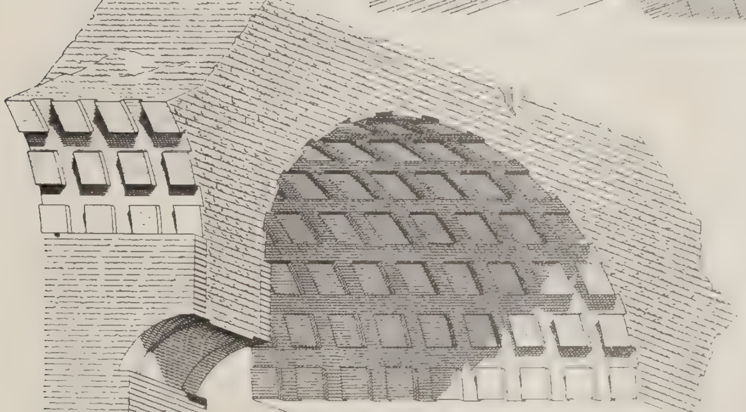


PLATE III. THE ART OF BUILDING AMONG THE ROMANS. SEE PAGE 152.







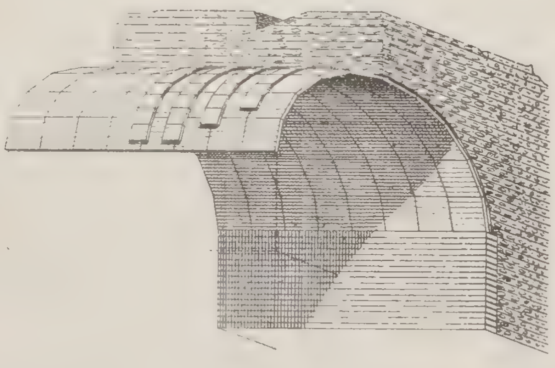
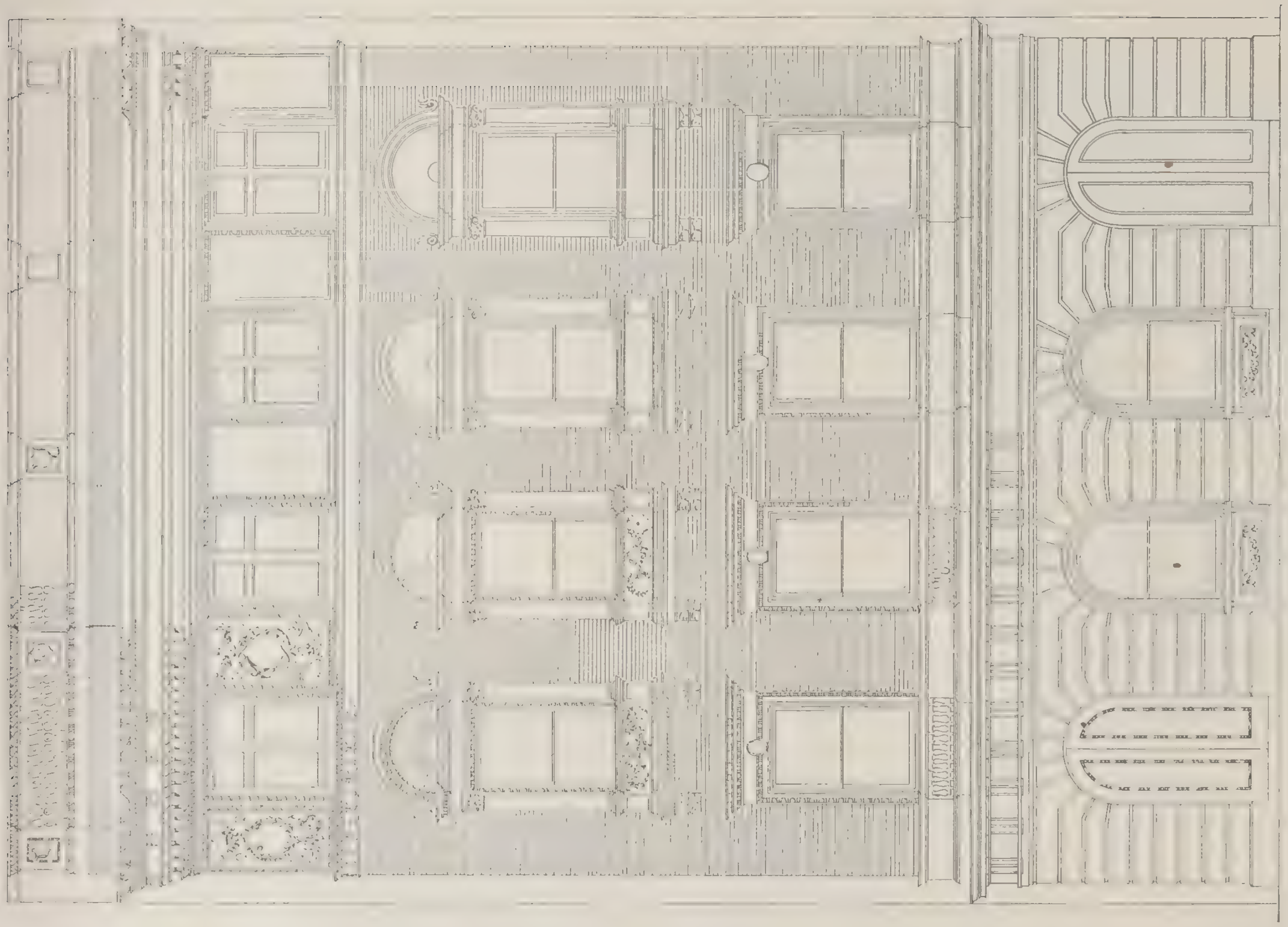


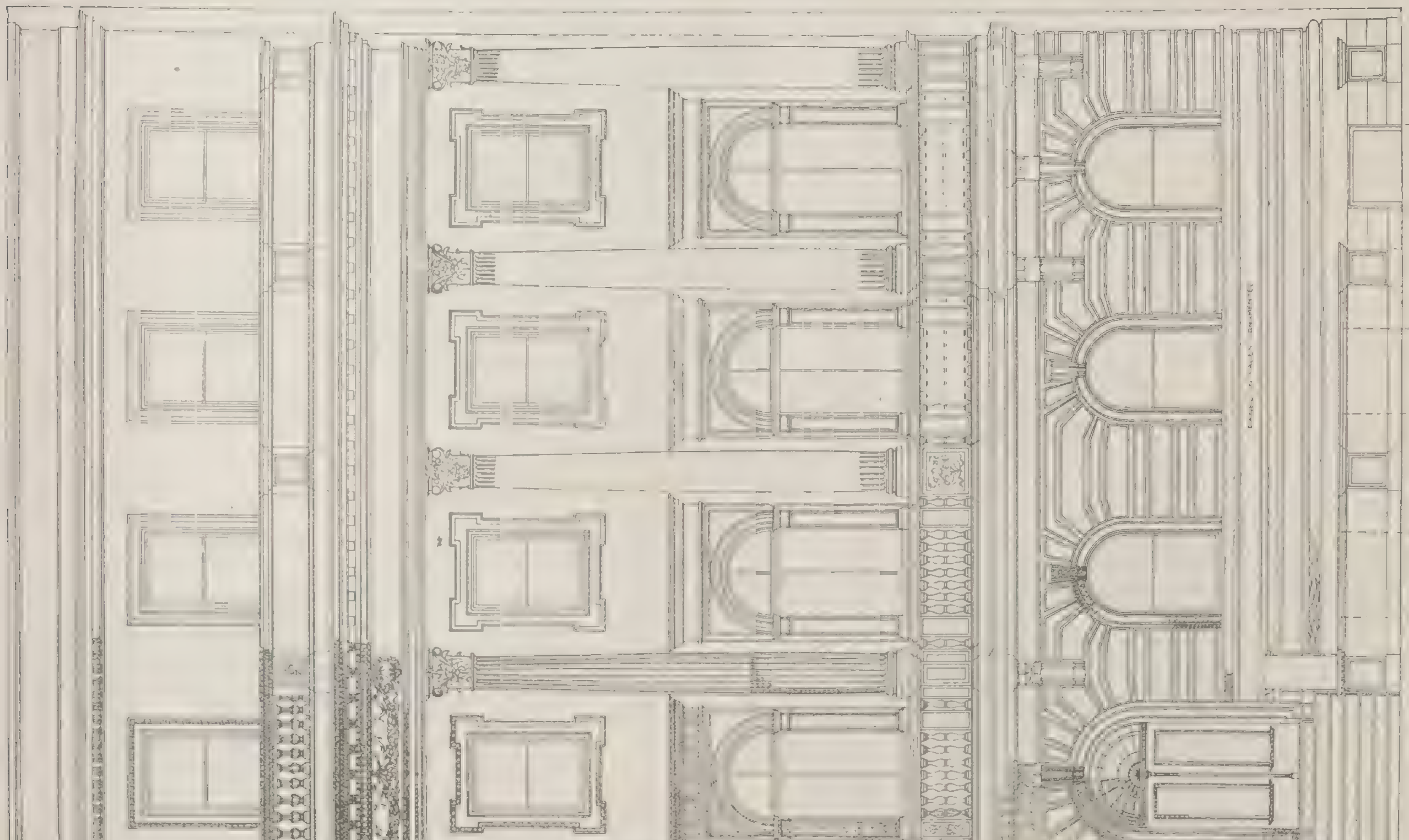
PLATE IV. THE ART OF BUILDING AMONG THE ROMANS. SEE PAGE 152.

BRICKBUILDER COMPETITION FOR A CITY HOUSE.

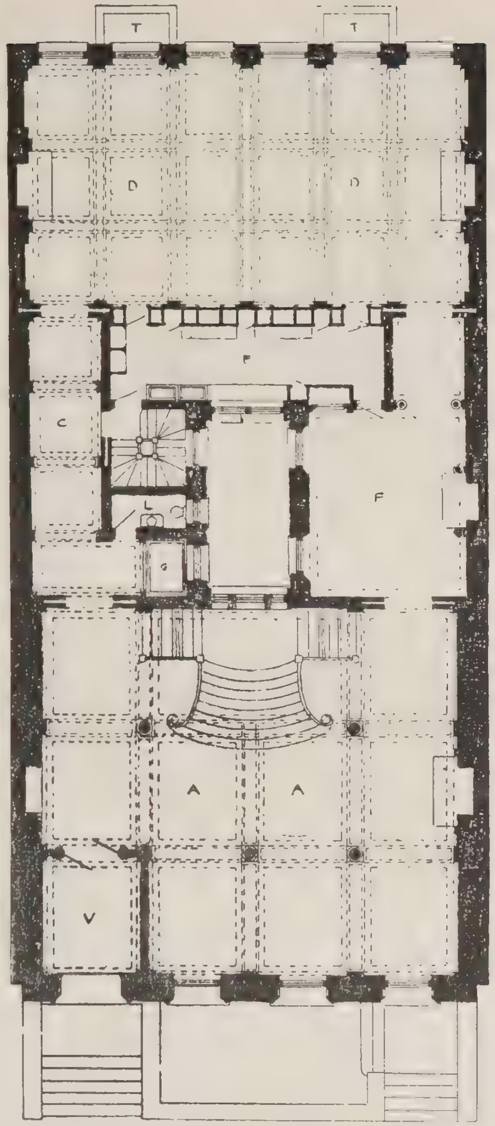
Elevations at one eighth inch scale.



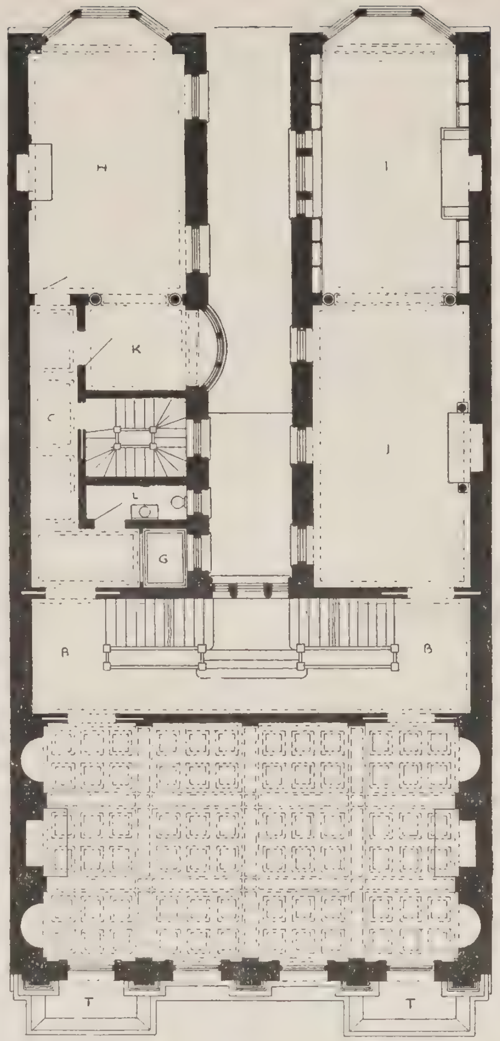
Sixth Prize, J. Mills Platt, Rochester, N. Y.



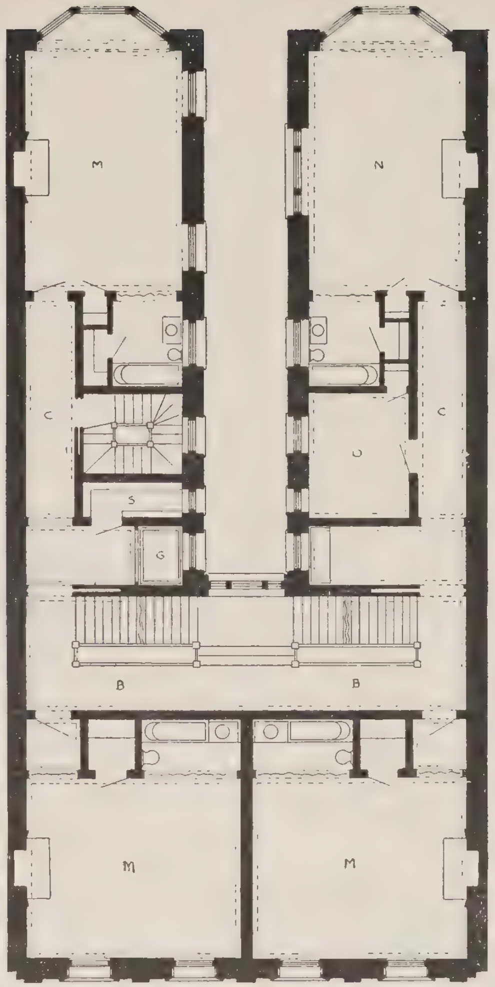
Fifth Prize, Edwin R. Clark, Lowell, Mass.



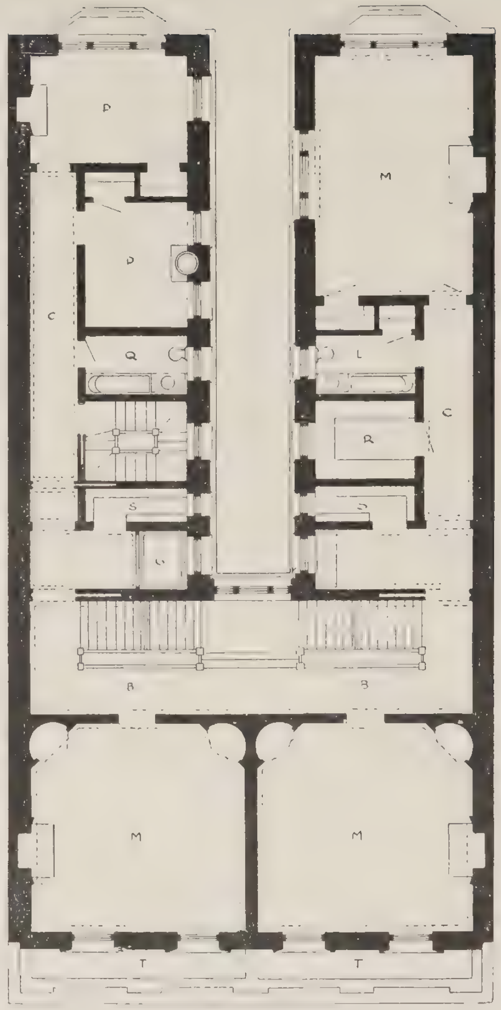
FIRST FLOOR



SECOND FLOOR



·THIRD FLOOR·



FOURTH FLOOR

BRICKBUILDER COMPETITION FOR A CITY HOUSE.

FIFTH PRIZE, EDWIN R. CLARK, LOWELL, MASS.

Plans at a scale of one sixteenth of an inch.

The first floor arrangement consists of vestibule, V; reception hall, A; grand dining room, D; pantry, E, and breakfast room, F. In dividing for two houses, the changes consist of a centre partition through hall, dining room and pantry; the addition of another vestibule and front entrance in the opposite corresponding bay, and changing breakfast room F, into a staircase, etc., similar to other side.

The second floor contains the drawing room, staircase hall, B; sitting room, H; library, I, and music room, J, with small conservatory at K. The library and music rooms together form a picture gallery. In dividing, a centre partition would be put through drawing room and staircase hall; also, service stairs, lavatory, etc., would be added, substantially as in other side.

The third floor consists of chambers, M, M, M, with small dressing or toilet rooms; a nursery, N, with bath; maid's room, O, and staircase hall, B. The changes necessary for dividing this floor are slight and obvious.

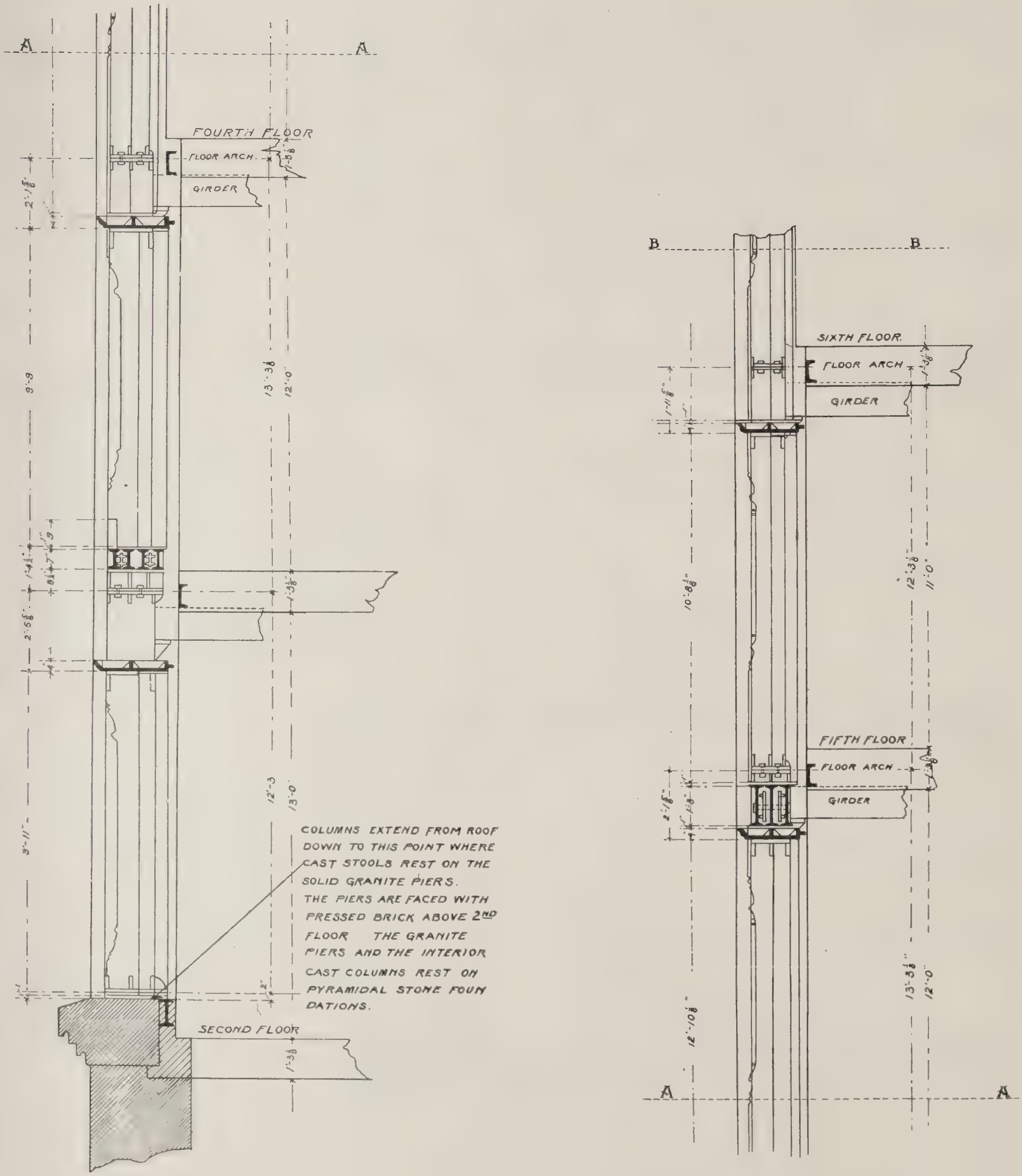
The fourth floor consists of chambers, M, M, M; servants rooms, P, P, and bath, Q; lavatory at L; linen closets, S, S, and large store closet, R. The changes on this floor would be unimportant, and are quite obvious.

Balconies, T, are shown on the plans. The grand staircase and elevator, C, communicate with roof, which is intended for a summer garden.

The basement would contain a billiard room in front. In the rear, a kitchen, communicating with pantry above by staircase; also, small elevator, laundry and store room; also in the basement, cellar to contain heating apparatus and storage vaults.

I feel that some apology is due for the execution of the façade drawing, but lack of opportunity has prevented proper rendering of the drawing.

The materials are to be buff brick and white terra-cotta, the terra-cotta to be richly ornamented. The first store or basement portion of the façade to be rusticated; the courses to be terra-cotta, panelled, and the panels to be decorated.

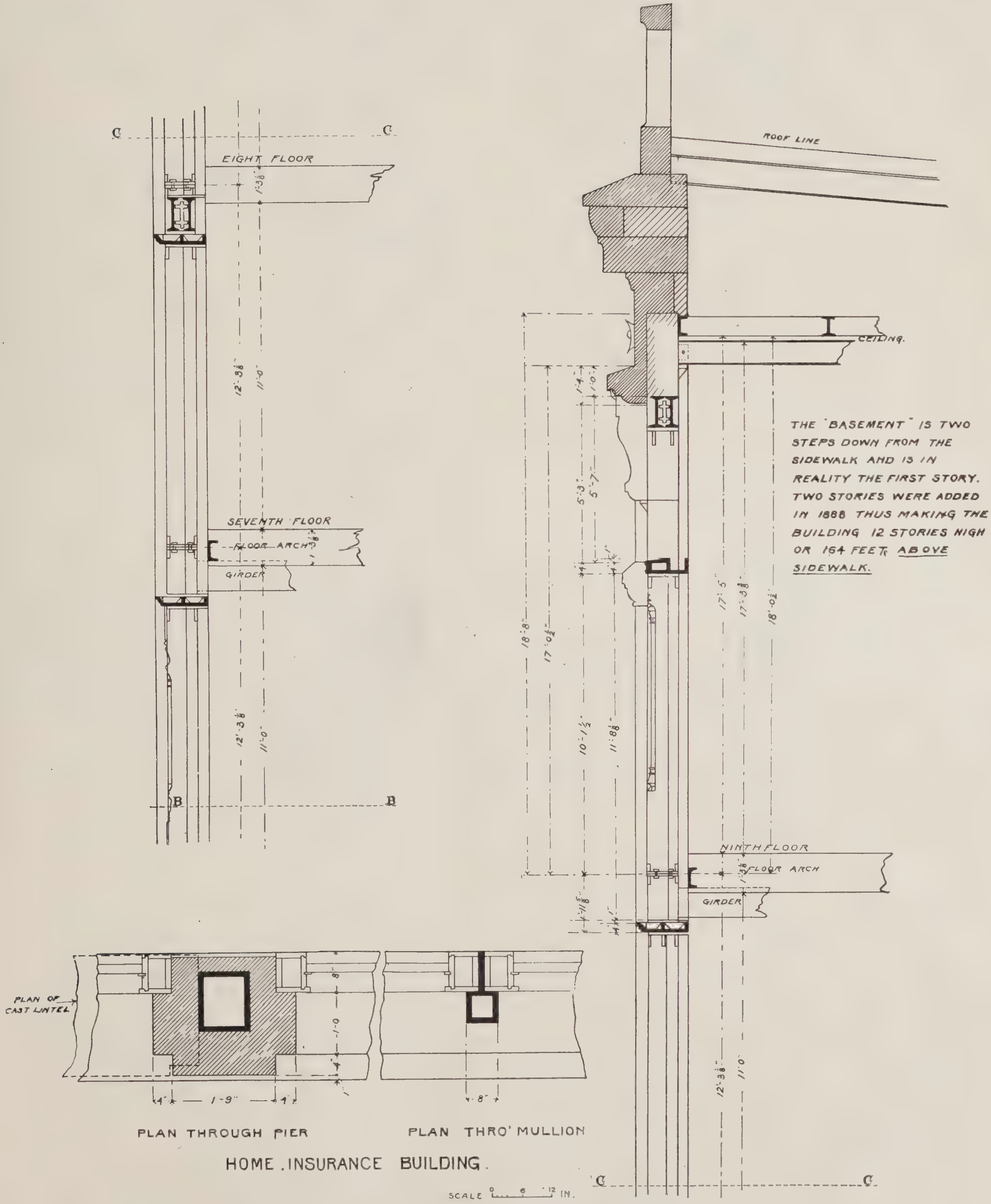


COLUMNS EXTEND FROM ROOF DOWN TO THIS POINT WHERE CAST STOOLS REST ON THE SOLID GRANITE PIERS. THE PIERS ARE FACED WITH PRESSED BRICK ABOVE 2ND FLOOR THE GRANITE PIERS AND THE INTERIOR CAST COLUMNS REST ON PYRAMIDAL STONE FOUNDATIONS.

WALL SECTION SHOWING
CONSTRUCTIONAL IRON WORK.
HOME INSURANCE BUILDING
CHICAGO.

SCALE 0 6 12 IN.

DETAILS OF FIREPROOF CONSTRUCTION. See Department on Page 157.



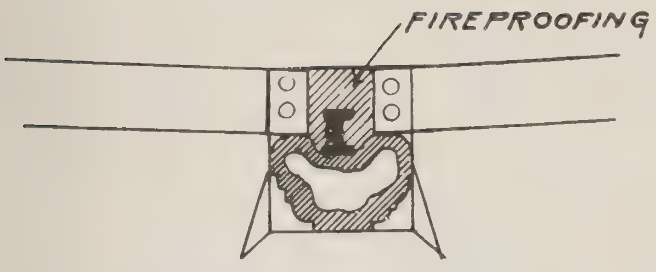
THE "BASEMENT" IS TWO STEPS DOWN FROM THE SIDEWALK AND IS IN REALITY THE FIRST STORY. TWO STORIES WERE ADDED IN 1888 THUS MAKING THE BUILDING 12 STORIES HIGH OR 164 FEET ABOVE SIDEWALK.

PLAN THROUGH PIER PLAN THRO' MULLION

HOME. INSURANCE BUILDING.

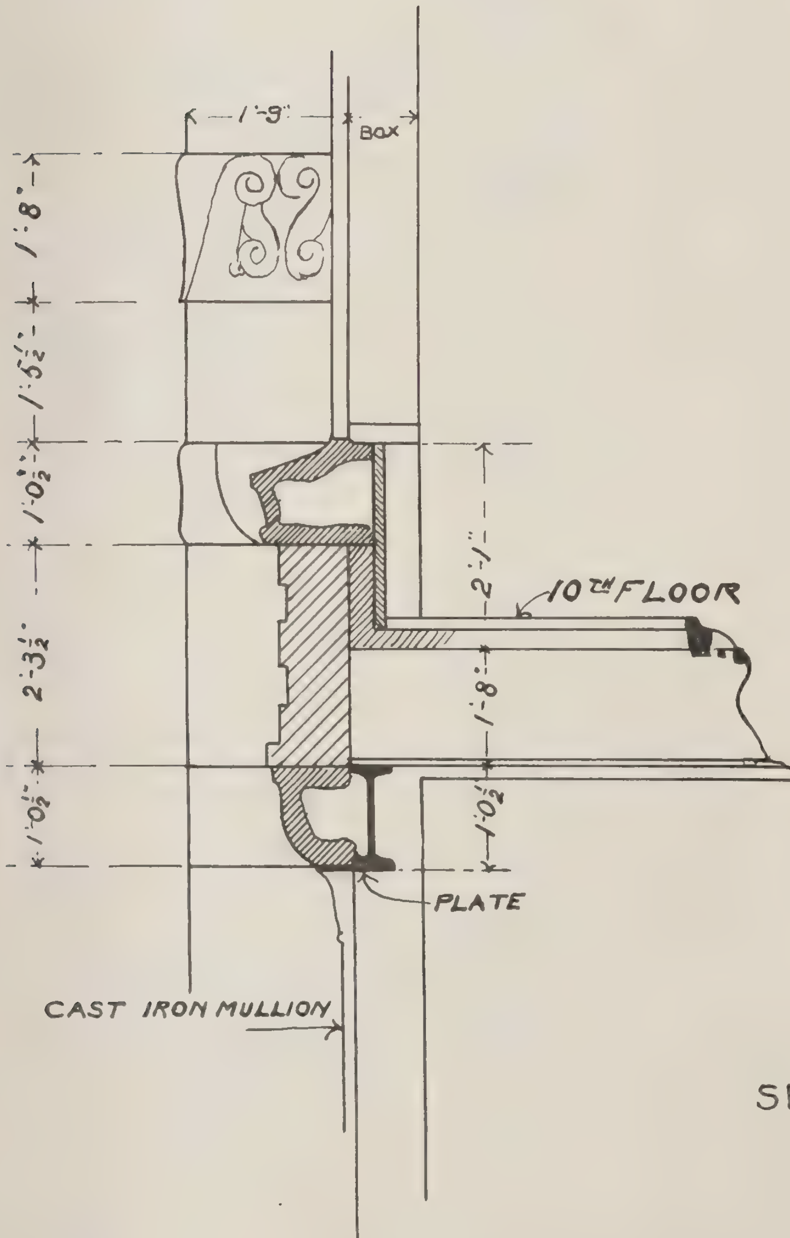
SCALE 0 6 12 IN.

DETAILS OF FIREPROOF CONSTRUCTION. SEE DEPARTMENT ON PAGE 157.



MULLION IN ORIELS

SCALE 0 6 12 IN.



SECTION THRO' FRONT WALLS.

ROOKERY BUILDING

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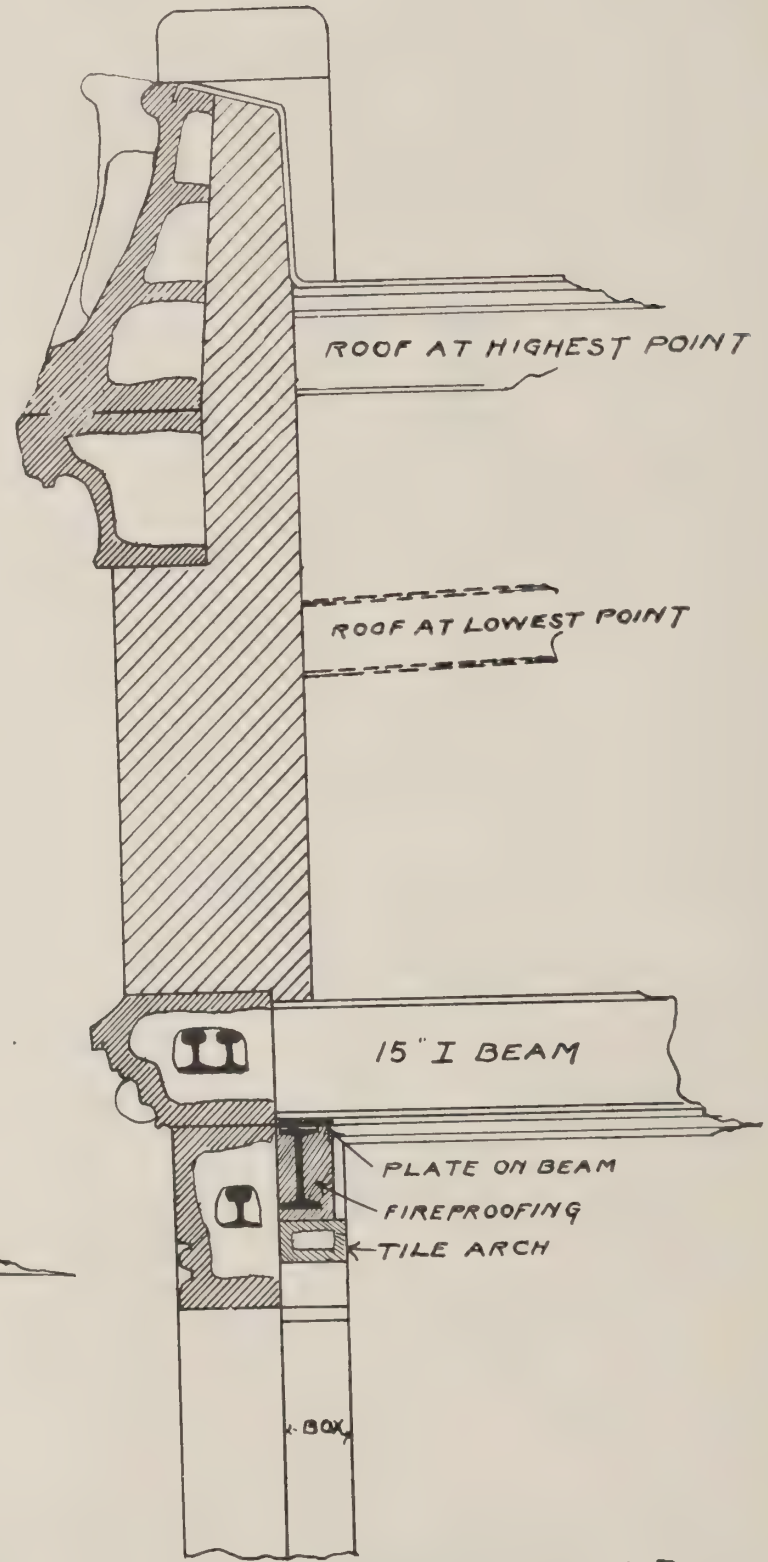

SECTION THRO' FRONT WALLS

ROOKERY BLDG.

DETAILS OF FIREPROOF CONSTRUCTION. See Department on Page 157.

THE BRICKBUILDER.

AN ILLUSTRATED MONTHLY DEVOTED TO THE ADVANCEMENT OF ARCHITECTURE IN MATERIALS OF CLAY.

PUBLISHED BY

The Brickbuilder Publishing Company,

CUSHING BUILDING, 85 WATER STREET, BOSTON.

P. O. BOX, 3282.

Subscription price, mailed flat to subscribers in the United States and Canada	$2.50 per year
Single numbers	25 cents
To countries in the Postal Union	$3.00 per year

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Entered at the Boston, Mass., Post Office as Second Class Mail Matter, March 12, 1892.

THE BRICKBUILDER is for sale by all Newsdealers in the United States and Canada. Trade Supplied by the American News Co. and its branches.

PUBLISHERS' STATEMENT.

No person, firm, or corporation, interested directly or indirectly in the production or sale of building materials of any sort, has any connections, editorial or proprietary, with this publication.

THE loss of Mr. Arthur Rotch to the architectural profession is a serious one. It is seldom that there is found a man with large means, making constant effort, unnecessary as a factor of professional work, who remains as enthusiastic, as earnest, and as devoted to the welfare of his profession as has Mr. Rotch. From the time of his return from his studies abroad he has constantly endeavored to further all ideas that tended to architectural advance in this country. In his association with the Committee on the Tarsney Bill, in his interest in public improvements, his instrumentality in founding the first American Travelling Scholarship, he has been a very definite power towards intelligent and most satisfactory advance in architecture. His advice, which has been often asked, has always been carefully considered, and of value when given, and in many ways which have only been seen by his associates and not by the public, the sincerity of his interest in his profession has often been shown. His bequests serve as evidence of his character. They could not have been bestowed to better purpose.

IT is certainly to be regretted that there is a tendency among some manufacturers of brick and fireproofing terra-cotta to frequently cut prices in order to underbid a competitor, to that extent that not only is it apparent that all profit has been sacrificed, but the actual cost of manufacture is not obtained.

While it must be admitted that in times when business is generally stagnant the tendency of prices is downward, such conditions do not, however, offer a reasonable excuse for the present demoralized condition of prices on these materials.

If a certain manufacturer or number of manufacturers persist in sacrificing profit and cost in making estimates, the remedy is not in following such examples, but rather leaving them to their own methods, the evils of which may be counted upon to supply the remedy.

The natural advantages that these materials have over others, in the matter of cost and necessity, confine the responsibility of this unhealthy competition almost wholly to the manufacturer or his agent, although it must be admitted that there are cases where an architect will resort to the unprofessional-like and dishonest methods to which we refer editorially in the July issue.

We believe that competition should be regulated by the elements that enter into manufacture, and in this respect certain economic questions play a very important part.

Unquestionably a concern that is well managed and that has sufficient capital to carry on its business, whose plant is well located as regards transportation, and the raw material used, has an advantage in the market when the two most essential requisites, cost and quality, are considered over one in whom these elements of strength are lacking, and yet it is principally because of the "bucking" between those two classes that the present ruinous prices prevail.

We do not wish it understood that this applies to all manufacturers of these materials; on the contrary, we know of many who, regardless of the demoralizing influences with which their market is beset, have continued to conduct business on business principles, and who are found to-day making the least fuss about "hard times."

We commend such to those who are sapping this splendid business of its vitality; for to follow the strong is to be strong, and to follow the weak is to be weak.

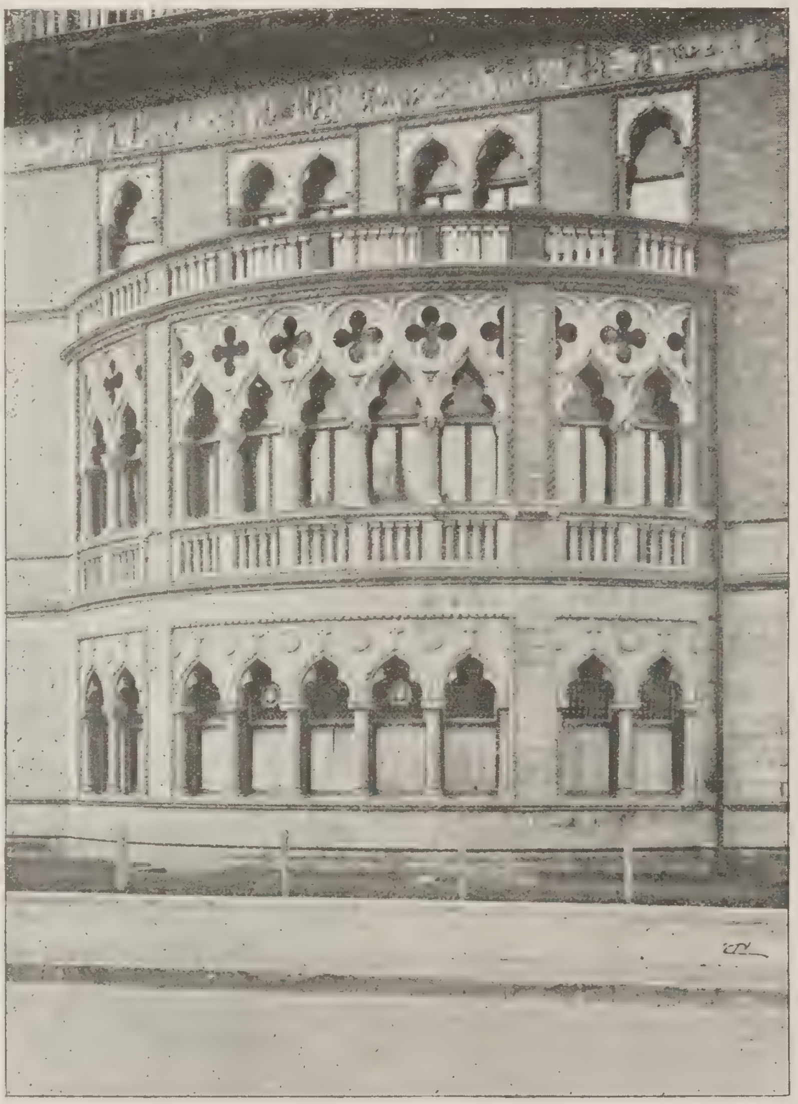
WE take pleasure in announcing an arrangement with the Hydraulic Press Brick Company of St. Louis whereby a full-page advertisement will be published for a year, under our direction. It is the aim of the company, or really the combination of companies (for there are now many offshoots from the parent concern in St. Louis) to present something in their space that will be of intrinsic value to the architectural readers of THE BRICKBUILDER, and do their share towards the artistic advancement of brick architecture in this country. Accordingly they have asked us to design a decorative border for their page, into which will be worked the addresses of the several companies, this forming what there is in the way of an advertisement. Within this border we shall publish each month, at their expense, some photographic reproduction of foreign brickwork that we consider of value as a suggestion to American architects. We cannot too highly commend this kind of advertising, and we believe it will be fully appreciated by our architectural readers, and prove the strongest possible advertisment. In the selection of subjects we will certainly do our best to meet our advertiser halfway in this improvement in the paper.

HENDRICKS' Architects' and Builders' Guide and Contractors' Directory of America has made its annual appearance, and is unquestionably the most complete and best compiled work of the sort ever issued in this country. Its list of architects numbers five thousand one hundred and thirty-four, and is pretty nearly correct, though there is a number of errors in spelling and initials, which in some cases has caused duplication, the name being entered under right and wrong spelling. It is accurate enough for all purposes of circular addressing. The directory contains considerable advertising, largely on colored inserts, and much of it put in to reach architects; though why this medium should be used for the one purpose it is probably least useful, we cannot see. We have never come across a single instance of an architect using this directory, though in the building trades it is constantly used.

A TRADE journal with a thousand subscribers often has a greater number of readers of the sort the advertiser wishes to appeal to than the daily paper circulating a hundred thousand copies. — *Printer's Ink.*

MR. J. C. Anderson, the well-known brick manufacturer, has adapted his double-tunnel brick kiln for the cremation of garbage, which is loaded on cars and passed through the kiln. The firing is done by oil, and an ingenious device in the shape of an air poker is used to stir up and fully consume the garbage. This poker consists of a long tube having flexible connection with an air pump, so that fresh air can be blown with great force into the midst of the burning garbage, thus immensely aiding complete combustion.

MESSRS Hazelhurst & Huckel of Philadelphia have given the best examples of their work publication in an attractive book, bound in white and gold. The buildings of interest in a brick and terra cotta line are many, among them being a large city residence in the Renaissance style on Locust and Sixteenth Streets, for Mr. Daniel Baugh; the bricks for this residence were furnished by the Eastern Hydraulic-Press Brick Company. The Odd Fellows' Temple on Broad and Cherry Streets is a fine structure, in which the same company placed a buff Roman brick. A second house on Locust and Sixteenth Streets is also shown, which possesses special interest as brickwork. The other buildings illustrated are a fine factory building on Fifth and Cherry Streets, a twenty-five foot residence on Locust Street, and a residence on Sixteenth Street, near Oxford.



DETAIL OF THE MONTAUK CLUB, BROOKLYN, N. Y.

F. H. KIMBALL, ARCHITECT, 55 BROADWAY, NEW YORK. TERRA-COTTA BY THE NEW YORK ARCHITECTURAL TERRA-COTTA COMPANY.

A NEW journal in the construction and material field has just come to hand. It is *The Monument, Sculptor, and Decorator*, published in the interests of workers and dealers in granite, marble, clay, terra-cotta, bronze, plaster, cement, and composition. It is of small value to architects, judging from its initial number, though to gravestone makers it is probably satisfactory. We wish, however, if it is going to publish statues in the nude, it would exercise more discrimination in the selection of subjects. The nude is not necessarily always artistic, and the two full-page cuts show very commonplace sculpture in this line.

WE have one criticism to make on the new department of ceramics and clayworking at the Ohio State University; it is installed in a rock-faced random ashlar building of sandstone. Perhaps we should be thankful for the course and not ask for too much; but we hope the day is not far distant when the increase in scholars will make it necessary to erect a new building, which should be, architecturally, a model of brick and terra-cotta design and construction.

BRICK, a new monthly devoted to clayworking, contains a description of wall construction in India, which is interesting, though we question its value over the regular form of concrete construction. The wall is faced with tiles, which are made L shape in section. The wall is started by laying upon the levelled-off foundation an outside and inside course of tile, placed thus, L ⅃. The space between is filled with concrete up to the top of the tiles, and a second course of tiles is similarly laid which is also filled with concrete, and so on, as high as the wall is to be built. One flange of the tile thus serves as a facing, and also as a form to hold the concrete, while the other flange, imbedded in the concrete, holds the facing with fair security.

MR. C. H. Peters, Government architect at the Hague, Holland, is engaged in an exhaustive study of ancient brick architecture in Europe. None of the results of his research have, so far as we know, been given to the public, even in the shape of papers read before societies. We expect, however, that the work will be published in book form when completed.

BRICK, Windsor & Kenfield's new monthly, publishes in its initial number an instructive parallel in railway culverts, one of stone, the other brick. These were built by the Chicago, Milwaukee & St. Paul, R. R. Co. In remarking upon the two forms of construction, *Brick* says: "No derricks are necessary; all the material is easily carried, and delivered at the required spot by unloading from the car, in chutes; the stone coping, which only serves as a roof to cover the top joints of brickwork, is light enough to be laid by hand. The brick construction is safer and can be built in less time than one of stone. Its first cost is lower, it is more durable, and good brick can generally be procured sufficiently near the work to make long shipments unnecessary."

It seems on first consideration as though this was so true that railroad engineers who have been constructing expensive stone culverts have been going to needless expense. If there is any reason why stone is better than brick we would like to have it brought to our attention.

NEXT month an exceptionally interesting number in point of illustration will be published, the cloister of San Zenone at Verona being a special feature.

FIREPROOFING.

A Department Conducted in the Interests of Building Construction to Prevent Loss by Fire.

A HISTORY OF STEEL SKELETON CONSTRUCTION.

(*See Plates 62, 63, and 64.*)

THE PIONEER OFFICE BUILDINGS OF "CHICAGO CONSTRUCTION."

PREVIOUS articles have illustrated the wall construction of some of the latest office buildings. This month is presented a sketch of the beginnings of the "skeleton," or what is known as "Chicago construction."

For the development of every great departure in art or science, several minds seem to have been working simultaneously on the same originating idea. No one knows who originated any particular style in architecture. Each was a growth, the products of many minds. So to a certain extent was it with the development of the construction of the modern office building. Many architects have contributed hard work and fruitful thought to such effect that one can look at the latest building and scarcely know what ideas were his own and what he borrowed from his co-laborers.

The first ten-story building in Chicago, one to rear its head one or two stories higher than its predecessors, was the Montauk, built in 1881, corner Monroe and Dearborn Streets, Burnham & Root, architects. The walls of this building were of the regular masonry construction, faced with pressed brick, arches over the windows, iron beams carrying brick floor arches. The contribution here to the future office building was in the foundations. It was undoubtedly the first case where steel or iron rails were used for foundations. Most of the foundations of the Montauk were of the isolated pyramidal stone type. But these where they would have interfered with the boiler plant were omitted, and low platform foundations made of rails were substituted. Gen. Sooy Smith was consulting engineer when these foundations were devised.

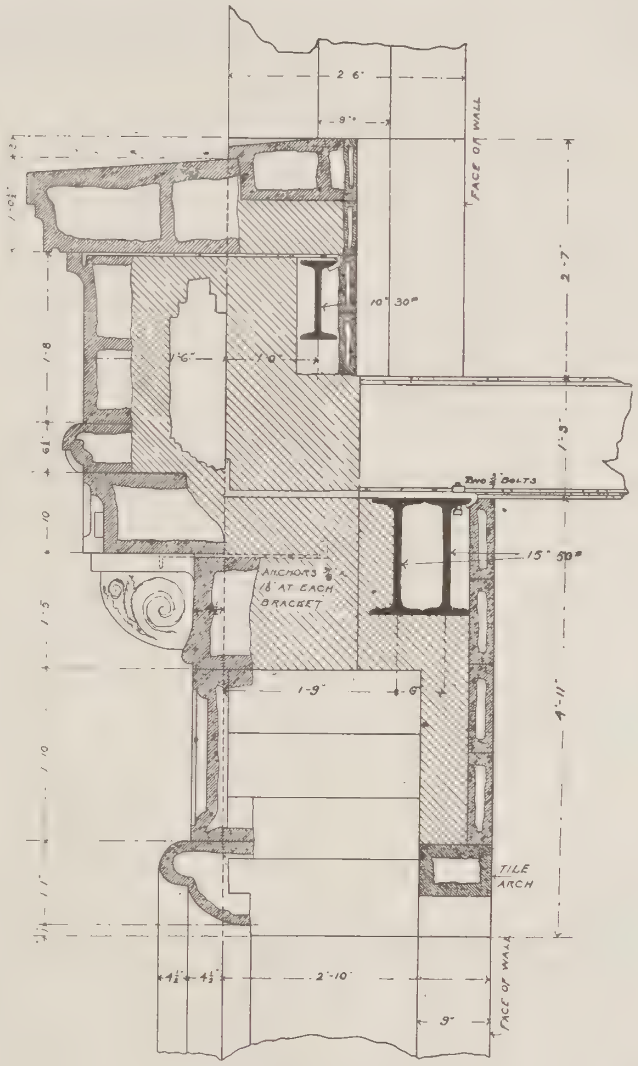
In conversation with the writer, Mr. D. H. Burnham has said that the credit of inventing the isolated foundation belongs to Mr. P. B. Wight, who used them to replace faulty foundations under the American Express Company's Building on Monroe Street, H. H. Richardson, architect. The invention and wide use of steel foundations should be accredited to Messrs. Burnham & Root.

The cantilever idea for foundations of party walls, another important feature of "Chicago construction," was Mr. Burnham's own idea, and was used first in the Rand-McNally Building, which followed closely, in point of time, the Home Insurance and Rookery buildings.

"But the skeleton construction," remarked Mr. Burnham, "that belongs to Mr. Jenney."

The first building to embody the "skeleton construction" idea, that is, in which the metal framework supported the floors, and even the masonry covering, was the Home Insurance Building, corner of La Salle and Adams Streets.

In the fall of 1883, W. L. B. Jenney of Chicago was appointed architect for the Home Insurance Company of New York City, and instructed to prepare designs for a tall, fireproof office building to be located on the northeast corner of Adams and La Salle Streets, Chicago, and to be known as the Home Insurance Building. The instructions required that the plans above the second story should provide for the maximum number of well-lighted small offices. The instructions further stated that the Building Committee were aware that this would necessitate very small piers, smaller probably than were admissible if of ordinary masonry construction, except perhaps in the upper stories. The architect was requested to report to the Building Committee the method of construction that would satisfy the requirements for stability and for small piers.



SECTION THROUGH ORIELS ON LA SALLE ST.
THE ROOKERY.

It naturally followed that if brick or stone was insufficient to carry the loads on the piers, a material must be provided that would support a greater load per unit of section.

Architects had often been obliged to build an iron column into a masonry pier where the load was exceptionally excessive. Mr. Jenney had done the same thing, building iron columns into two or more of the small piers in street front of the Fletcher and Sharp Building in Indianapolis some years before.

The natural solution of the problem was to enclose an iron column within the small masonry pier, thus satisfying the three requirements, a small pier, strong, and fireproof.

The question of expansion and contraction of a column one hundred and fifty feet high under the extreme variation of temperature, say 130° Fahr. or more, from the hot sun in summer to excessive cold nights in winter, now presented itself. A solution was soon found by the architect in supporting the walls and floors of each story independently on the columns, thus dividing the total movement into as many parts as there were stories, the expansion and contraction in no one being of sufficient importance to require special consideration.

The drawings were now prepared, and the first design for a fireproofed skeleton construction was presented to the Building Committee of the Home Insurance Company for their acceptance.

As business men they naturally inquired, "Where is there such a building?" The architect replied, "Your building at Chicago will be the first." This naturally suggested to the company the very important question, "How do we know that it is good?" The architect proposed to submit his designs and calculations to one or more bridge engineers of distinction as the company might select; the design for the skeleton building resembling in many respects an iron railroad bridge standing on end.

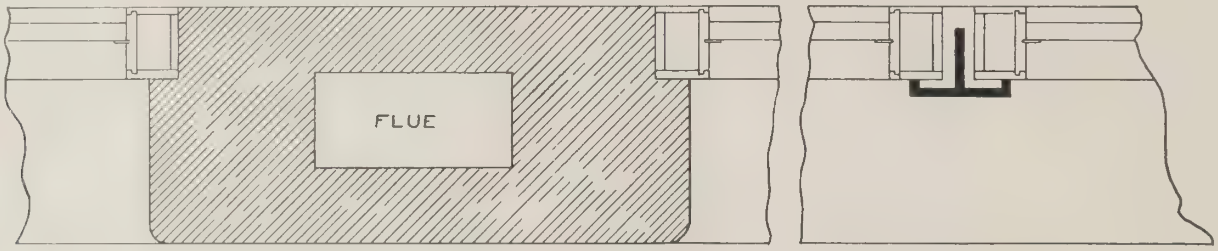
At this juncture Gen. A. C. Ducat, one of the managers of the Western Department of the Home Insurance Company, claiming the floor and the privilege of making a speech, stated that he had been an engineer before he became an insurance man, and that he had carefully studied the designs and the data for the calculations as presented by Mr. Jenney, and that they met his approval both constructively and economically, and that he would respectfully suggest that they be adopted, and that the building be commenced at the earliest date practicable. The motion was offered, seconded, and carried unanimously, and the building commenced.

Mr. Jenney has often stated that the question of applying for a patent occurred to him at the outset, but inasmuch as the first drawings for this skeleton construction seemed to him to be making general over an entire building what had been done before in a single pier, he did not think that the patent could be successfully defended if attacked. Still he regrets not having made the application, as it would have established conclusively his priority.

The columns in the Home Insurance Building were cast-iron. The riveted columns of plates and angles and other forms were at that time thought too expensive. It was in this building that the first Bessemer steel beams were used, manufactured by the Carnegie Phipps Company, who stated at the time that the Home Insurance Building was the first in the United States to use steel beams in its construction. These were only advance samples, however, of the new Bessemer steel beams. The great majority of beams in this building were iron.

In completing the details of construction, the assembling of the parts, wind bracing, etc., it was found necessary to invent special arrangements, the iron railroad bridge being the only precedent.

Since the Home Insurance Building, the most important improve-



PLAN OF PIER

PLAN THRO' MULLION

ROOKERY BUILDING

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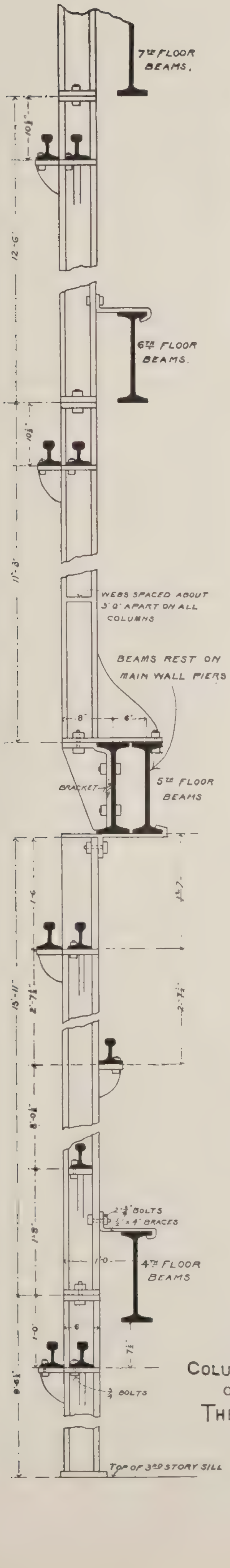
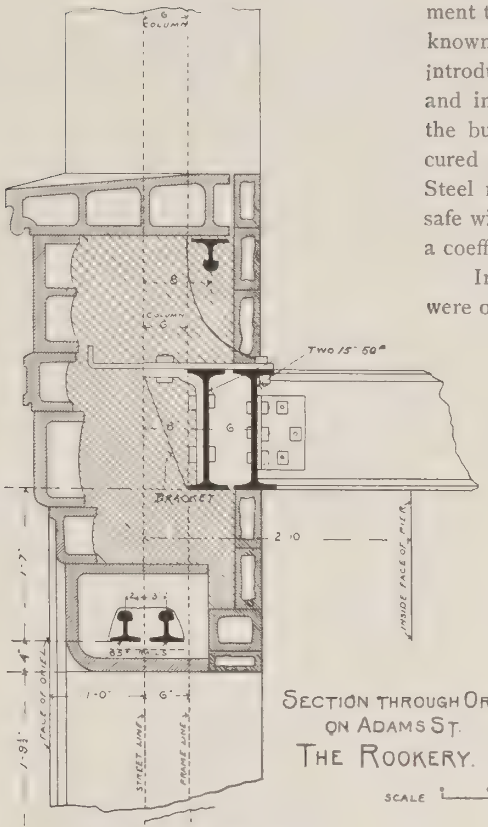


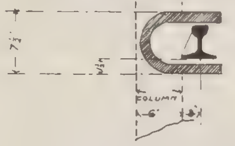
COLUMNS IN ORIELS ON ADAMS ST

THE ROOKERY.

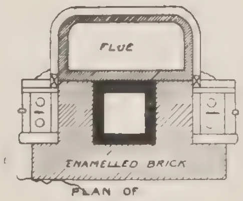


SECTION THROUGH ORIELS ON ADAMS ST.

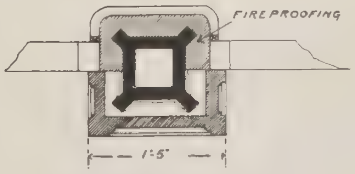
THE ROOKERY.



SECTION OF TRANSOMS ORIEL ON ADAMS STREET.



PLAN OF COLUMN IN COURT



PLAN OF COLUMN BELOW COURT ROOF

ROOKERY BUILDING

ment that has been made in this class of construction, now generally known as the Chicago construction, or the steel construction, was the introduction of steel riveted columns, which are now made cheaply, and in all respects thoroughly satisfactory. All the assembling at the building is done with hot steel rivets; increased rigidity is secured as well as a material reduction in the weight of the columns. Steel riveted columns as now manufactured are considered perfectly safe with a coefficient of safety of four, while for the cast-iron columns a coefficient of safety of eight is not considered too great.

In the Home Insurance Building the foundations below ground were of pyramidal masonry (being in this respect a step behind the Montauk), dimension and rubble stone resting on a thick bed of concrete, each column exterior and interior in the basement having its own independent foundation. The footings on the clay were loaded uniformly per square foot throughout the building. The soil being compressible, it was necessary to use great care in calculating the dead loads and the actual live loads that would obtain in order to secure as near as practicable absolute uniformity of load per square foot on the clay throughout the entire building.

The success in this respect was demonstrated by the very uniform settlement. The maximum variation throughout the building at the end of a year was found by the most careful levelling by an engineer to be a little less than three quarters of an inch, while the total settlement was more than three inches. This total settlement was fully anticipated, and the building was started some four inches above grade to allow for this settlement.

By reference to the illustration showing framing in outside walls, it will be seen that for the two street fronts solid granite piers were used two stories high, and the columns began on top of these. Note also that the mullions are cast columns, carrying cast lintels through three stories to a point where heavy lintel beams are inserted to transfer the load to the pier columns. In later buildings cast lintels were dispensed with, lintel beams were placed at each story, and the mullions became only stiffening angles to prevent windows from being blown in.

Just as the Home Insurance Building approached completion, the well-known Rookery (Burnham & Root, architects) began its foundations just across the street. A number of advances on the Home Insurance are here recorded, although in the main street fronts massive piers instead of encased columns were used to support themselves and the floors. Rail foundations were used, lintels were fireproofed, and many details were well studied, although the use of rails for lintels in places seems now rather clumsy.

In the Home Insurance Building mullions and other columns, some in court walls, were exposed. In the Rookery the mullions are not supporting members, and almost all beams and columns are fireproofed with hollow tile, enamelled brick, or terra-cotta. In the court yellow glazed terra-cotta lintels and sills were used. Thus one could continue to trace development from building to building.

Among the illustrations presented are details (which will be printed next month, and for which acknowledgment is made to D. H. Burnham & Co.) of the Reliance, a fourteen-story building now being erected in Chicago. Details are shown also of a four-story $400,000 stable erected for the American Express Company. In this the outside walls support themselves only. The floors are carried on Phœnix columns. The tile floor arches are five inches thick, span ten feet, and rest on long span twenty-inch beams built of plates and angles.

It is hoped that these details will prove valuable for comparison, and suggestive to those who are interested in the further development of skeleton construction.

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MORTARS AND CEMENTS.

A Department devoted to Advanced Methods of using Cements and Limes in Building Construction.

A REVIEW OF VARIOUS METHODS OF CONCRETE CONSTRUCTION AS APPLIED IN ENGINEERING WORKS.

A COMPARISON OF THE COMPOSITION OF VARIOUS CEMENTS ARRANGED WITH A VIEW OF DETERMINING THEIR RELATIVE VALUES IN CONSTRUCTION.

IT is proposed in the present paper to go somewhat into the detail of the composition of various cements, inasmuch as the constructive values of cements depends very largely upon the amount of variation in the proportion of the various elements that compose them; and it will be of interest to show the manner in which we may progress in the formation of cements from their simplest form as they exist in lime mortar to the complex hardening of the best Portlands.

As has already been shown in a preceding paper, the hardening of cement is due to a chemical union between two and often three primary substances, — lime, silica, and alumina, — and as far as the formation of concrete is concerned it is of no consequence whether this union takes place in a few hours or continues slowly through hundreds of years: the result is the same. We may therefore begin with

LIME MORTAR,

which, though not ordinarily called a cement, inasmuch as it shows none of the qualities belonging to a real cement, within ordinary limits of time, still a union of its elements is gradually taking place and ultimately will result in a hard compound in all respects similar to a cement. The length of time required to bring this about depends on the quality of the sand used in making the mortar; and with ordinary sand, which contains little soluble silica, the process may continue for centuries, while with pozzolanas, which are rich in soluble silica, the hardening is of sufficient quickness to warrant the use of these mortars in damp localities and even under water. Inasmuch, however, as the hardening of ordinary lime mortar is due entirely, as far as practical results are concerned, to the absorption of carbonic oxide from the air, we will consider at present only that form of lime mortar which shows distinct setting properties, namely: that made of pozzolana and those remarkable sands used so extensively in the buildings of Rome.

The mortars made of these peculiar sands are veritable lime mortars as far as the simple mechanical mixture of lime and sand is concerned; but they possess, in addition, all the qualities belonging to a real cement.

POZZOLANA, SANTORIN EARTH, TRASS, ETC.

These are the various names used to designate a peculiar sand which has the property of uniting immediately with nascent lime to form cement. They are variable in quality, some being more adapted to use in wet localities than others. The santorin earths are especially noted for their power of conferring hydraulicity upon fat limes, while trass has been extensively used in Holland in submarine works of importance. A comparison of the elements of these pozzolanas will demonstrate the variation in the proportion of silica, those possessing the lowest amount of silica being the least adapted to hydraulic work.

	Pozzolana, Rome.	Santorin Earth.	Trass.
Silica	48	69	51
Alumina	14.3	15	16
Magnesia	3.9	2	5
Oxide of Iron	10	4.5	5
Lime	7.7	2	10
Alkalies	4	8	13
Sand	3	....	....
Water	9.1	....	....

Nascent lime is obtained by the calcining of lime rock, the fresh burned lime being immediately slaked and mixed with the pozzolana sands. The union that takes place is precisely the same one that occurs when Portland cement is wet, namely, the formation of a complex double silicate of lime and alumina. So that in the making of concrete the ultimate results are similar, whichever process be used.

It is interesting in this connection to note the latest and one of the most clever and economical applications of this fundamental principle of cement making, as shown in the manufacture of

BRICK AND ARTIFICIAL STONE

by Mr. E. L. Ransome, the well-known cement expert.

The process consists first of making a sand containing a large proportion of soluble silica. This is accomplished by burning out the combustible material in ashes and waste products, and at a high temperature converting the mineral base of these materials into hard silicious slag,— a veritable pozzolana. The combustible materials are converted into fuel gas and used in various operations about the works. Second, nascent lime is produced by burning lime rock either in the same furnace or independently, and the slag and nascent lime

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are then ground together and pressed into bricks or other moulded forms. The brick are then placed under water, the indurating proceeds indefinitely, and the product is a concrete of great strength and durability. The wonderful economy of the whole process, the conversion of waste material into building stone, is a great step forward in economics, and no less interesting is the fact that this is the same old Roman principle developed and refined in the light of modern science.

ROMAN CEMENT, HYDRAULIC LIME, AND ROSENDALES.

We have up to this point discussed a class of cements which are formed during the process of making the concrete, and which had no distinguishing qualities as cements until their component parts were brought together in the mortar that formed the matrix of the concrete. We come now to a second division, which includes cements proper,—those which have an individual existence as cements, and are used as such. These are of two kinds, the natural and the artificial. Under natural cements we include a large field, — all so-called Roman cements as used in England, all hydraulic limes as found in France, Belgium, and the shores of the Mediterranean, and the Rosendales, which have such extended use in America.

These cements are composed of the same elements united in varying proportions. The cement rock is calcined and finely ground, and the product when mixed with water sets, and acquires a considerable degree of hardness. It is obvious that the value of these natural cements depends, first, upon the proportion of the elements of which they are composed; and, second, upon the uniformity of this proportion: for the first gives the cement its strength and its construction value, while the second insures the confidence of its users. It is also obvious that disregarding the process by which the cement is produced, there is great chance for variation in the composition of cement rock, and it is this continual variation that makes all natural cements assume a secondary position, aside from the fact that few of them attain the perfection in strength, conformity, and color that characterizes the real Portlands; and the fact that a cement is a natural cement marks that brand at once as one that must be used with caution.

The Roman cement was used very extensively at the close of the last century, before the development of the Portlands. It is made from nodules found in London clay, and consists of a dark colored aluminous limestone, with a composition of from 60 per cent to 70 per cent calcium carbonate, 18 per cent to 20 per cent silica, and 6 per cent to 10 per cent of alumina. These proportions are variable, however. The cement is light in weight, quick setting, and deteriorates rapidly after manufacture, nor does it acquire great hardness.

The hydraulic limes, especially the Chaux de Theil, find extensive use in France, Belgium, and along the shores of the Mediterranean, large quantities being used in the construction of the Suez Canal and many important harbor works. These limes are similar in composition to our Rosendales, are moderately hydraulic, quick setting, and show the variation common to natural cements. It is true that some of these cements approach the high standard of the Portlands, and possess qualities that warrant their use in important works, but they should be watched carefully, constantly tested, and used with discretion.

Many brands of these natural cements assume the name "Portland," when in fact they have no claim to that title. It may be true that they often develop a strength equal to some Portlands, but even that does not entitle them to rank in that class. The natural cements possess certain characteristics that impose a limit upon their usefulness, and they must be content to be governed by those characteristics, for they can never hope to attain the perfection of the great German cements, and their claim to rank with them is a usurpation of distinction that they cannot defend. They have a wide range of usefulness, and the development of the process of manufacture will advance them as they deserve in the estimate of their users, but they must be content to stand upon their own ground and not try to borrow excellence by the assumption of a name.

The following table shows the variation of the ingredients in the raw material used in the manufacture of Roman cement, hydraulic limes, and Rosendales, fat limes, etc.

	Carbonate of Lime.	Carbonate Magnesia.	Iron, Sand, etc. Alkalies, etc.	Water.	Silica.	Alumina.	
Fat Lime.......	100	......	......	......	......	....,	Carrara Marble.
Fat Lime.......	94.5	2.5	1.2	1.8	......	....	Oolite.
Poor Lime......	79	3.7	12.4	4.2	......	.....	Oolite.
Eminently Hydraulic Lime.	71.6	1.4	3	.5	20.1	3.5	English.
Eminently Hydraulic Lime.	65	1.5	8	.5	22.5	2.5	Chaux de Theil.
Slow Setting Cement	63	2.5	4.5	......	24	6	English Portland (artificial).
Moderately Quick Setting	43.3	26	8.1	1.9	16	4.7	Rosendale.
Quick Setting...	54	14.2	15.9	3.7	8.8	3.4	Roman Cement.
Quick Setting...	65.7	.5	8.7	1.3	18	6.6	Roman Cement.
Quick Setting...	46	17.8	5.6	.7	22	8	Rosendale.

PORTLAND CEMENTS.

We come now to a class of cements which are so well known as to require little description. They are artificial cements, the product of scientific investigation, and the perfection of the principle underlying all cement hardening. By analysis and constant experiment, the exact proportions of lime, silica, and alumina necessary for the production of the most perfect union have been determined, and the mechanical processes for mixing, burning, and grinding, have been so perfected as to produce a cement the quality of which leaves nothing to be desired. They are, for all practical purposes, absolutely uniform in quality; the average composition of a good Portland is shown in the above table; they develop tremendous strength in concrete; they are economical, and may be used with large proportions of aggregates; they are invariable in color, and for hydraulic qualities have no rival. The German Portlands are the finest in the world in all respects, and an engineer may be at ease when his work is being done with these standard cements. The English Portlands are more variable, coarser ground, and less economical. The processes of manufacture differ widely in the two countries, and possibly the characteristics of the people of the two nations are shown in the results of their work.

The Portland cements of American manufacture have a long road to travel before reaching the standard of excellence achieved by our rivals across the water; but with the great quantities of material suitable for this work at hand, it is only a question of time when American ingenuity will devote itself to the production of a domestic cement of equal quality with any in the world. The writer is not aware of the existence of a cement plant in the United States in which the production is carried on precisely as in Europe, nor is the term "Portland" justly assumed by a great majority of American cements. It is doubtless true that several grades of domestic cement have attained a high standard and are suitable for use in important work, but they are few, and extraordinary care must be observed in their use, and every precaution taken to guard against the great bugbear,— variation,— for until that is absolutely overcome, no cement can hope to take precedence of those excellent products which, by long and successful use, have proven themselves worthy of the highest regard, and which have won for themselves the first place in the confidence of professional builders.

ROSS F. TUCKER.

GOOD MORTARS.

THEIR COST, STRENGTH, AND DURABILITY; HOW TO MIX PROPERLY.

PERHAPS the most important factor in the erection of brick or stone structures is the mortar; and it behooves every architect and builder, therefore, to know what is the best mortar and how to make it, that in the near future masonry may regain the prestige it once held, and be no longer known as "the lost art."

Lime Mortar. The calcination of statuary marble, or any other fine variety of limestone, produces quicklime, by expelling from the carbonate of lime of which it is composed the carbonic acid gas, water of crystallization, and organic coloring matter. Lime is, therefore, a protoxide of calcium, or, in other words, a metallic oxide. Pure lime has a specific gravity of 2.3, is amorphous, somewhat spongy, highly caustic, quite infusible, possesses great avidity for water, and if brought in contact with it will rapidly absorb twenty-two to twenty-three per cent of its weight, passing into the condition of hydrate of lime, in which condition it is said to be *slaked.* Lime, on account of its great affinity for moisture, and when moist for carbonic acid, absorbs them gradually from the atmosphere, and returns to the carbonate of lime. To protect it, therefore, from these deteriorating agents, it is necessary to preserve it in close vessels, and thus the best lime for use is the fresh burned.

The limestones which furnish the limes of commerce are seldom, if ever, pure, but usually contain, besides the carbonate of lime and water of crystallization, variable proportions, seldom exceeding ten per cent in the aggregate of some, if not all, of the following impurities: silica, alumina, magnesia, oxide of iron, and oxide of manganese, and sometimes traces of alkalies, the presence of which modifies, to a certain degree, the phenomena developed during the process of slaking, and renders necessary certain precautions in their manipulation and treatment when employed for the purposes of construction. The common fat or rich limes ususally contain less than ten per cent of the impurities mentioned above. In slaking they augment to form two to three and one half times that of the original mass. They will not harden under water or even in damp localities excluded from the air, but in the air they harden by the gradual formation of carbonate of lime, due to the absorption of carbonic acid gas.

The pastes of fat lime shrink in hardening to such a degree that they cannot be employed as mortar without a large dose of sand. Paste of fat lime may be added to a cement mortar in quantities equal to that of the cement without material diminution of strength. The poor or meagre limes generally contain silica, alumina, magnesia, and other impurities in amounts seldom less than ten, or more than twenty-five, per cent of the whole. They dissolve in water frequently renewed, and are not adapted to be used under water or wet soil.

The hydraulic limes, including the three subdivisions of limes slightly hydraulic, hydraulic limes and limes eminently hydraulic, seldom contain an aggregate of impurities exceeding thirty-five per cent of the whole. They slake still slower than the meagre limes.

Air-slaked lime makes a poor mortar, and an excess of water in slaking (usually called drowning the lime) is also injurious.

The strength of all mortars depends to a much greater extent

DYCKERHOFF PORTLAND CEMENT

Is superior to any other Portland Cement made. It is very finely ground, always uniform and reliable, and of such extraordinary strength, that it will permit the addition of 25 per cent more sand, etc., than other well-known Portland Cements, and produce the most durable work. It is unalterable in volume and not liable to crack.

8,000 barrels have been used in the foundations of the Bartholdi Statue of Liberty, and it has also been used in the construction of the Washington Monument at Washington.

Pamphlet with directions for its employment, testimonials and tests, sent on application.

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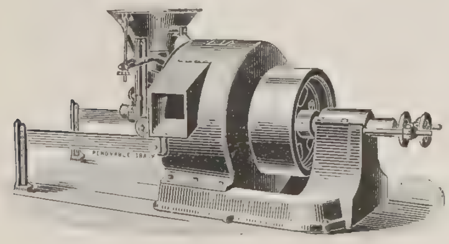

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Made of Blocks of Rock Emery set in Metal, making the hardest and most cutting millstone ever built, and not expensive.

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We can grind from 70 to 75 bbls. Louisville Cement per hour with your Rock Emery Stones. This is from 10 to 15 bbls. more per hour than our ordinary stones will grind. Since May 3 have dressed these but twice. Ordinary Stones we dress every three days. Rock Emery Stones save us several dollars per week in dressing alone.

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RAPID — because Rock Emery has no equal for cutting qualities. ECONOMICAL — because Rock Emery is the most durable grinding surface known. NO EXPERIMENT — because many large manufacturers in your own line already use and indorse them, and hundreds in use for other purposes.

SEND FOR CIRCULARS AND REFERENCES.

STURTEVANT MILL COMPANY, 70 KILBY ST., BOSTON.

than is generally supposed upon the thoroughness of the mixing. In ancient times some one with some conception of the manner in which lime and sand unite superintended the mixing, but nowadays builders imagine that any good laborer can make mortar properly.

The best mode of slaking, as far as regards the quality of the mortar, is by sprinkling the dry lime with a hose until the lime is in the form of putty, then cover with sand. The proportions of one measure of lime and five measures of sand is about the average used for common mortar by good builders in our principal cities, and if both materials are well mixed, the mortar is as good as can be required for ordinary purposes, and require no addition of hydraulic cement. The bulk of the mortar will usually exceed that of the dry sand about one eighth part. An excess of water in slaking the lime swells the mortar, which remains light and porous, or shrinks in drying; and an excess of sand destroys the cohesive properties of the whole mass.

The tenacity or cohesive strength of hardened good common lime mortar, according to careful trials and experiments by General Totten of the United States Army, with mortar only six months old, varies from 00 to 34 pounds per square inch, or from 864 to 4,896 pounds, or from .39 to 2.19 tons per square foot. About fifteen and a half pounds per inch is near this gentleman's experience, and is quite as high as can be safely risked in practice. It is true that his experience showed that at the end of four and a half years some of the mortars had acquired from two to three times greater strength, but others in that time increased but one third part. Moreover, in practice, the working strains are generally brought upon masonry by the time that some of its mortar is not more than six months old or even less; therefore, we cannot avail ourselves of the additional strength given by time, but if such increase is needed speedily, we must add cement.

The crushing force may be taken at fifty tons per square foot, or seven hundred and seventy-seven pounds per square inch.

The sliding resistance, or that which common mortar opposes to any force tending to make one course of masonry slide upon another, is stated by Rondelet to be but five pounds per square inch, or about one third tons per square foot in mortar six months old.

The adhesion to brick or stone may ordinarily be assumed to be at least equal to its cohesive strength in properly executed work.

There is risk in using common mortar in cold weather. If the cold should continue long enough to allow the mortar to set well, the work may remain safe, but a warm day may occur between the freezing and the setting of the mortar. In that case the walls will always be weak, for mortar that has partially set while frozen, if then melted, will never regain its strength.

The American Architect asserts that adding salt to mortar in cold weather to preserve it from the bad effects of freezing has been found highly beneficial. Engineers and contractors who have tried it are unanimous in their praise of it. Many cases are seen where masonry has been laid in cement in cold weather, using salt in the mixture, which, after repeated freezing and thawing, has remained in perfect condition, while work near by, laid in mortar of the same kind, but without salt, has been disintegrated by the frost.

The *cost* of mortar varies in different localities according to the price of sand, lime, etc. The quantities and proportions only can be given, and the builder must figure the cost from these. With bricks of 8 x 4 x 2 inches, the following are the quantities of mortar as compared with the whole mass.

SIZE OF JOINT.	AMOUNT OF MORTAR IN WHOLE MASS.	NO. OF BRICK IN CUBIC YARD.	NO. OF BRICK IN CUBIC FEET.
$\frac{1}{8}$	$\frac{1}{9}$	638	23.63
$\frac{1}{4}$	$\frac{1}{4}$	574	21.26
$\frac{3}{8}$	$\frac{3}{10}$	522	19.33
$\frac{1}{2}$	$\frac{1}{3}$	475	17.60
$\frac{5}{8}$	$\frac{4}{10}$	433	16.04

(Trautwine, C. E.)

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"The results of tests with standard quartz are far above the average of most cements."
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"This brand of Portland Cement was found especially qualified for the purpose of concrete casting on account of its perfect uniformity, intensive fineness, progressive induration after the first setting, and of its great tensile and crushing strength."
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GUARANTEE.

1 day in air, 6 days in water, - - - - - 400 lbs. } Neat test
1 " " " 27 " " " - - - - - 500 " } Per square inch.
1 " " " 3 months in water - - - - 600 " }
3 parts of sand to 1 of cement.— Adhesive test.
1 day in air, 6 days in water, - - - - - 125 lbs. } Per square inch.
1 " " " 27 " " " - - - - - 175 " }

FINENESS.

Residue on sieve No. 50, - - - - - - - - - None.
" " " " 100, - - - - - - - - 10 per cent.
Passing through sieve No 200, - - - - - - - - 65 "

Every barrel guaranteed to stand the boiling test, the test for safety.

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MANUFACTURERS OF

BEACH'S ROSENDALE HYDRAULIC CEMENT.

Guaranteed to stand all required tests.

115 Broadway, NEW YORK.

From the foregoing information the mason can easily calculate how much his mortar will cost per thousand bricks laid, or per cubic yard of stone.

In the next number we shall try to show the best mode of mixing and using *cement mortar*.

R. N. Buell, New Britain, Conn.

DIRECTIONS FOR THE EMPLOYMENT OF PORTLAND CEMENT.

(FROM A PAMPHLET PUBLISHED BY E. THIELE, NEW YORK.)

THE results obtained from the employment of a good Portland cement depend in a great measure upon the correct observation of a few rules, here laid down, which those not experienced with Portland cement, and no matter how great their experience may be with natural cements, lime, etc., should study carefully.

GENERAL OBSERVATIONS.

Quick-setting cement should only be employed in cases where changes of tide, a sudden rush of water, very low temperature, or other causes may require it.

Slow-setting cement, such as the Dyckerhoff, is best adapted for most purposes. It permits an easy and thorough preparation of the mortar or concrete, and, possessing greater tensile strength than quick-setting cements, a larger proportion of sand can be added.

After the first hardening, slow-setting cements harden more rapidly and more intensely than quick-setting cements.

Portland cement is very seldom used neat or pure; nearly in every case sand is added for mortar, or sand and gravel, or sand and broken stone, for concrete, except for the plastering of cisterns, where neat cement is rubbed into the coat of plastering, to obtain the greatest impermeability.

The sand, gravel, and broken stone to be added to the Portland cement, as well as the water, must be perfectly clean, free from loamy or earthy substances, and the sand as sharp as possible.

Loamy sand should be cleaned by washing.

Soft stone and very fine sand should be avoided, or the finest particles removed by passing the sand through sieves.

Where cement is used for plastering brick or stone walls, the walls should be thoroughly cleaned, washed, and repeatedly sprinkled with water, which will prevent the dry stone or brick of the wall from absorbing the water in the cement, necessary for its hardening.

For the same reason, porous sandstone, bricks, etc., to be used in masonry, should be thoroughly soaked in water. Where extraordinary strength and durability are required, as in foundations for machinery, the stone or bricks should be allowed soaking under water for some time.

All cement work, cement plastering, artificial stone, etc., should be guarded against drying too rapidly.

ATLAS PORTLAND CEMENT.

WARRANTED EQUAL TO ANY AND SUPERIOR TO MOST OF THE FOREIGN BRANDS.

OFFICIAL TESTS, Nos. 3567 and 3568, made by the DEPARTMENT OF DOCKS, New York, March 31, 1894, being part of contract No. 464 for 8,000 barrels.
TENSILE STRENGTH, 7 days, neat cement . . . . 622 lbs.
" " 7 days, 2 parts sand to 1 of cement . . . . 332 lbs.
Parts steamed and boiled . . . . Satisfactory.

All our product is of the first quality, and is the only American Portland Cement that meets the requirements of the U. S. Government and the New York Department of Docks. We make no second grade or so-called improved cement.

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Buff and Pompeian Brick Laid
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If the cement is to obtain its maximum hardness, all such work should be kept moist for several weeks.

It is an error to suppose that any kind of sand or gravel will answer. Cement will not bind loamy sand or loam, and concrete made with such will not attain any density or hardness and will only result in the waste of the cement and labor.

PREPARATION OF PORTLAND CEMENT MORTAR.

Spread out the exactly measured quantity of sand, pour upon it the exact quantity of cement and mix the whole dry until it has an even color. Then add slowly by sprinkling the required quantity of water, while the material is being constantly and carefully stirred and worked up. Continue such mixing for some time and excellent mortar will result.

One to two parts of sand to one part of cement are only added in cases where unusual strength, great impermeability to water, or great resistance to wear are required.

Three to five parts of sand to one part of cement produce an excellent mortar for masonry, plastering, etc.

The addition of water for mortar should be greater with quick-setting than with slow-setting cements.

Mortar of slow-setting cement (such as the Dyckerhoff) prepared with just sufficient water to produce a stiff paste, produces the best work, and attains the greatest durability.

If too much water is added the hardening sets in very late, especially in damp and cold weather, and the work will become less dense and therefore less durable.

IT will be the endeavor of the publishers to make this department of THE BRICKBUILDER the representative periodical of the Cement trade, and the coöperation of all importers and manufacturers is solicited.

A WHITE PORTLAND CEMENT.

A RECENT number of the *American Architect* contains the following editorial: —

"We have at this moment a call for some white Portland cement, and would be very glad if any of our readers could tell us where such cement can be procured. It is made in Germany, or, at least, a white Portland cement was, at one time, advertised in the German building papers; but we have never heard that any was imported, nor do we know that any is manufactured in this country. As Portland cement is made simply of lime and clay, there ought to be no difficulty in finding a clay which would burn white, and, by mixing this with white limestone, in producing a perfectly white Portland cement, having all the strength and other good qualities of the ordinary dark-colored cement. If such a material could be had, we think that there would be a large demand for it. The use of concretes, both for inside and outside work, is extending very rapidly in this country. For inside work, the disagreeable color of the Portland cements has been an insuperable objection to their use, and Keene's cement, a poor and weak material, according to modern ideas, has held its place against them; but Keene's cement is totally unfit for the paving, staircasing and protection of ironwork now required, and a thoroughly reliable cement, of a white, or very light, color, would be a most useful material."

THE attention of mason contractors is called to this department, on Mortars and Concretes. Writers of practical experience in the mason-contractor business have been engaged to write upon subjects which they consider of the most value to the largest number of those engaged in this business. Through these columns we will have inquiries as to the use of Mortars and Concretes, answered by specialists, with whom arrangements have been made for this very purpose.

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RICKETSON MINERAL PAINT WORKS
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THE MANUFACTURER.

A Department devoted to the Market Side of Clay Production.

ROMAN-SHAPE COMMON BRICK.

AND OTHER MATTERS FOR THE MAKER OF COMMON BRICK TO CONSIDER.

JUDGING from the many letters received in time for publication in our last issue and almost as many more of the same tenor received since, there is a field for manufacturers who will make a good common brick, Roman shape. Such a brick would not be used for common construction where no effect of wall surface was desired, but for a front brick in places where the regular and more expensive pressed brick cannot be used. In country work particularly, when the high finish of pressed brick is not desirable, the rougher common brick, varying in shade and made Roman shape, would find many uses. We consider the correspondence published last month, coming from almost every section of the country, a sure sign that there is a market for this class of brick. Some of the architects writing favorably have large enough practice to support a brick manufacturer, and if approached by him with a proposition to get out such stock, would undoubtedly guarantee him large enough orders to make it worth while to put in a machine that would produce the Roman shape brick.

It is a matter in which we are deeply interested; and now that so many of our architectural readers have come out with no uncertain expression, we hope to see our manufacturing readers meet them half way. There is no way in which THE BRICKBUILDER can be of more direct value to the brickmaking industry than by thus bringing the producer and consumer together.

It has been a matter of disappointment that so few manufacturers have had anything to say. They have not even signified any willingness to consider the question. Of the several letters we did receive, only one, that from the Kensington Brick Company of Pittsburgh, gave any evidence of progressive spirit. This one exception we commend to our architectural readers as showing the proper spirit.

One manufacturer stated there was no market in his section, and yet a firm of architects in his own town, who have unquestionably the largest practice in that locality, express themselves ready to use such a brick in large quantities, and stated that they had often wanted just this thing but could not get it.

We hope to hear the manufacturers' side more fully before our next number.

Another question that has often been put to us by architects is where a moulded common brick can be had. There is no reason why any common brick machine cannot be fitted with the simpler forms of moulding, such as the cyma and ogee, and certainly in the case of hand-made bricks, the difficulty of making these patterns is inappreciable. They would have to be handled more carefully, but then they are not sold by the wagonload, and the extra price they would bring would more than pay for the extra care necessary in handling them in manufacture and delivery.

These are by no means idle or impracticable speculations. In this department we advance no ideas for manufacturers to consider that are not first suggested by the very parties most concerned, *i. e.*, the buyers and consumers.

In every branch of trade the production is governed by the market. Whatever will sell will be made. Our architectural subscribers, now comprising a large majority of the architects in the United States, take THE BRICKBUILDER because it covers one special field. When they want information on brickwork they consult it as the most reasonable place to get the information. If its articles or advertisements do not give them what they want to know, a letter to the editor naturally follows, for he certainly, if any one, is in a position to at least secure the wanted information. It is in this way that ideas come to us and are presented in this department.

In the case of moulded common brick, the first inquiry came from Cook, Hapgood & Co., architects, of Hartford, Conn., who really wanted to use such brick in work they then had under construction. Besides making an inquiry in our columns, and sending marked copies to over one thousand manufacturers of common brick, we had letters written directly to over three hundred brickmakers in an honest endeavor, not to help some manufacturer sell his bricks, but because we considered it our duty to spare no trouble or expense in getting information in our field that we knew a subscriber really wanted and had every right to expect of us. Not a single favorable reply was received. Since that first inquiry a dozen or more have been received. This indicates a demand for the article that is not a whim of one man, and no enterprising manufacturer can afford to wholly ignore it.

THE BRICKBUILDER goes to architects and builders, who take it for the sole reason that it is an assistance to them in their use of brick and terra-cotta. If certain architects whose work is known by reputation throughout the country find a certain shade of brick, or a certain style of detail effective and use it successfully, the illustration of it leads other architects to also try it, and so the "fad," as it may be called, spreads. H. H. Richardson started architects to using rock-faced sandstone and Byzantine detail. The influence of his work was superseded by the buff brick and terra-cotta craze set going by McKim, Mead & White's Madison Square Garden, Century Club, and other New York buildings. So was the Flemish bond with dark headers the natural result of a successful revival of this kind of brickwork, which the old buildings of Philadelphia and the Southern Colonial houses show was no new thing in this country.

The manufacturer must keep these movements in view and meet the demand of architects with suitable material. To enable him to do this with least expense and trouble is one of the chief missions of THE BRICKBUILDER, and it is exactly in this way that it can be of direct assistance to him.

BRICK GATEWAYS.

BRICK is not only a material *par excellence* for enclosure walls, but for entrances through such walls, or for monumental gate-posts it is one of the most effective materials in the hands of a good designer. As two very good examples of such gate design, we published in our May number the two gates at Harvard University, designed by McKim, Mead & White. One is a drawing, from a photograph, the other is a photographic reproduction. Of course these gates were expensive, but principally for the iron work. The bricks seem to be selected from stock rejected as unfit for the market. Upon close examination it is hard to find a good individual brick, from the manufacturer's point of view, yet the brickwork of these gates excites admiration of every architect. At "Westover," a Colonial mansion in Virginia, are gates, simple to an extreme, yet very effective, and there are numerous other examples, some of which will be published in subsequent issues.

In every city or town of any importance there is considerable expensive fence and wall building, but it is of stone, wood, or iron. Here is a chance for missionary work by the local manufacturer. There may not be opportunity now or for months to come, but remember this when the opportunity does come. In smaller cities, certain things become fads. We remember an instance illustrating this in a city of some twenty thousand inhabitants. A man was repairing an old house and induced a stained-glass firm in a neighboring city to put in a large plate-glass window with a stained-glass panel above it, on the chance of its setting the fashion. Within a year that company had orders for more than twenty similar windows from that city.

A wide-awake brick manufacturer, working with an intelligent mason contractor, could make the brick fence a "fad," by getting one job and doing it well. We would only too well like to co-operate with him, from start to finish. If the owner does not at once fall in with the idea, let us help convince him by sending him photographs and sketches of similar work already built. It is exactly the position we want to hold towards the manufacturer, — that of being an assistance n opening up and broadening his market. This department can only be in the roughest way suggestive. It is by direct correspondence on special work by hunting up and sending to him photos, sketches, by putting him in the way of getting designs, etc., etc., that we can best help him; and in return for any such services we ask nothing but that he subscribe to, and read, THE BRICKBUILDER, and use it in every way possible to increase his sales. By enlarging his own business he directly helps us.

THE COURSE IN CLAYWORKING, OHIO STATE UNIVERSITY.

FROM the very first THE BRICKBUILDER has strongly advocated the establishment of a scientific course of instruction in clayworking, in connection with one of the large technical schools. It has argued that clayworking is no more "practical" than the mining, iron working, or textile industries in which, as in every branch of manufacture nowadays, a technical training is of the greatest assistance. The idea of "college men" becoming good brickmakers has been ridiculed by the class of men in the industry who don't believe in improved methods of manufacture, and who value experience beyond everything; and well they may, for that matter, for "experience" is costly. But as this class do not and never will read THE BRICKBUILDER, what we have to say will affect them in no way.

The men in the clayworking industry who are striving to bring their art nearer perfection will give their heartiest support to the new course established under the able management of Prof. Edward Orton, Jr., at the Ohio State University, Columbus. This course is known as the Department of Ceramics and Clayworking. In it general principles of Chemistry, Mineralogy, and Geology will be taught, with enough mechanical engineering and shop-work to meet most requirements. Practical Clayworking will be studied in its application to the several divisions of the industry. Every clayworker should supply himself with the prospectus of the school, and do his best to promote its growth into a large and useful institution.

THE July *Clayworker* contains some good stuff on pages 45 and 49 relative to brickmakers using their own product. It is something we have done considerable pegging at, though why it should be necessary is beyond our comprehension. We have known of lumbermen building brick houses, but there is good reason for that, while the brickmaker who builds his house or office of wood is lacking somewhere in his headpiece.

ROMAN SHAPE COMMON BRICK.

THE following letters received since our last issue are especially decided in favor of this stock:

FRANCIS R. ALLEN, 220 Devonshire Street, Boston.

"I am of the opinion, very decidedly, that they would meet with a very large sale. I know that personally I should use them in preference to the better quality in many places.

"They would give a texture which cannot be obtained with any material at present available."

JARDINE, KENT & JARDINE, New York.

In regard to common brick made in Roman shape we feel certain we could make frequent use of them, and for some time have wished we could obtain them as easily as the ordinary shape. They have been used with great success in modern work, the effect being a delight to the eye. We feel sure that clients would willingly pay a little extra for them, because even now they are willing to pay extra for the yellows, drabs, grays, etc., of firebrick.

We wish to add a word as to the excellence of your periodical. It is by far the best publication proportionate to the cost which comes to us among a number of architectural papers. We wish you continued success.

WE give below the new schedule taken from the Senate-Wilson Tariff Bill on brick and tile, and clays or earths; also the rates under the McKinley and Mills Bills.

BRICK AND TILE.

	New Rate.	McK. Rate.	Mills Rate.
Brick, not glazed, enameled, ornamented or decorated in any manner, ad valorem	25%	$1.25 ton	20%
Glazed, enameled, ornamented, or decorated, ad valorem	30%	45%	20%
Magnesic fire brick, per ton	$1.00		
Tiles, plain, not glazed, ornamented, painted, enameled, vitrified, or decorated, ad valorem	25%	25%	20%
Ornamented, glazed, painted, enameled, vitrified, or decorated, and all encaustic, ad valorem	40%	45%	20% to 45%

CLAYS OR EARTHS.

Clays or earths, unwrought or unmanufactured, not specially provided for, per ton	$1.00	$1.50	Free
Wrought or manufactured, not specially provided for, per ton	$2.00	$3.00	$3.00
China clay, or kaolin, per ton	$2.00	$2.00	$2.00

Upon receipt of five two-cent stamps we will mail to any address in the United States a copy of the Senate-Wilson Tariff Bill, pamphlet form.

TRADE NOTES.

Yard Equipment.

CHAMBER BROS. COMPANY are to equip the new paving-brick plant of T. B. McAvoy & Sons, Philadelphia.

THE contract for equipping the extensive new brick plant at Cuyahoga Falls, O., has been given the Frey-Sheckler Co., Bucyrus, O.

THE Mill Hall Brick Works, Mill Hall, Pa., have recently had their yard equipped by the Simpson Brick Press Company, and report entire satisfaction with the result.

THE new Chisholm, Boyd & White Company will stick to the old concerns methods of making brick machinery as they have always filled all requirements in the most satisfactory manner.

MR. SIMPSON, the senior, pays a deserving tribute, by leaving the affairs of his extensive brick-machinery plant in the hands of Mr. Simpson, the junior, while he takes a well-earned sojourn in Europe.

ON Aug. 1, 1894, the well-known firm of Chisholm. Boyd & White, Chicago, manufacturers of the Boyd Brick Press, was succeeded by The Chisholm, Boyd & White Company. J. A. Boyd, president; B. C. White, vice-president; S. S. Chisholm, secretary and treasurer, with H. J. Flood and H. W. Boyd as directors in connection with the three officers named.

Clay Materials.

THE PERTH AMBOY TERRA-COTTA COMPANY are doing the Tremont Temple (Boston) work for Blackall & Newton.

THE Excelsior Terra-Cotta Company of New York have recently secured several good contracts in the New England field.

MR. W. H. Powell, treasurer and general sales agent of the Excelsior Terra-cotta Co., while in town recently made arrangements with W. H. Gates to handle the New England business for his concern.

THE JARDEN BRICK COMPANY have recently sold quite a large number of their buff bricks for buildings being erected in Boston. Mr. R. F. Stahl, Hancock Building, is their agent in this city.

RIGHT here in New England may be found one of the best equipped terra-cotta plants in the country. We refer to the New Britain Terra-Cotta Company, Berlin, Conn.

THE contract for the terra-cotta for the new Masonic Temple at Augusta, Me., has been given to the Excelsior Terra-Cotta Company, through W. H. Gates, their Boston agent. J. C. Spofford is the architect.

NEW YORKERS will soon have an opportunity to see the beautiful white brick made by the Powhatan Clay Company of Richmond, Va., as some are now being furnished for an eleven-story building on Broadway.

THE GLENS FALLS TERRA-COTTA COMPANY has been busy thus far this season, and at the present time is so rushed that material promised us for publication cannot be prepared for several weeks to come. This is a pleasant condition for the company, but it is inconvenient for the paper.

THE BROOKE TERRA-COTTA COMPANY of Lazearville, W. Va., want to secure agents in all the principal cities to handle their line of cream brick and other shades of buff pressed brick, on commission. Mr. T. W. Carmichael, the manager of the company, will be pleased to correspond with parties desiring further particulars.

THE new mottled brick made by the Gay Head Fire Brick & Clay Co., Chelsea, Mass., seems to have met with a cordial reception in the market. We learn from Mr. W. H. Gates, who is the exclusive agent, that he has recently placed a large number of the same in Boston and the other New England Cities.

MESSRS. EUGENE R. ATWOOD and William H. Grueby, formerly managers of the Faience Department of Fiske, Homes & Co., have both commenced the manufacture of glazed and enamelled terra-cotta, independently. Mr. Atwood has organized a company at Hartford, and Mr. Grueby at Boston, taking a portion of the Fiske, Homes & Co. plant at South Boston.

THE YALE BRICK COMPANY of Berlin are burning a kiln of pressed brick, from which great results are looked for.

The Yale brick is fast gaining a strong foothold with architects and builders and, wherever used, has given the greatest satisfaction, which reflects great credit upon the makers.

THE NEW BRITAIN ARCHITECTURAL TERRA-COTTA COMPANY have had plenty to do this month; have gotten out several large orders.

This company is able to furnish almost anything the mind can invent in the line of terra-cotta. Special designs are executed by them in the best shape, and, above all, with quick dispatch.

A HIGH grade common brick, bright in color, well shaped, fairly smooth and uniform, is in demand, and a manufacturer of such a brick readily finds a market for his goods. It is well worth the attention of brick manufacturers the growing popularity of such a brick as we mention. The architects are using them very freely and procuring some very effective results.

THE DONNELLY BRICK COMPANY of Berlin have been unable to get enough clay the past month to supply the demand for terra-cotta and fancy brick. It is surprising the way this concern's business has increased during the last two years under the skilful management of Mr. M. J. Donnelly. Their terra-cotta and fancy brick department is a comparatively new departure for them, but their enviable reputation in the manufacture of common brick at once placed their fine products in demand, and assured for their latest venture entire success.

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Agents for Canada, WATEROUS ENGINE WORKS CO., Brantford.

TRADE NOTES.

WE have received through the courtesy of James A. Davis & Co., Boston, a very attractive little volume entitled "Brick Roadways," issued by the Interstate Vitrified Brick and Paving Company of Philadelphia. This work contains an exhaustive treatise on brick pavement, and proves conclusively that, providing the right bricks are used and are properly laid, there is no better pavement known than a vitrified brick pavement.

EVERYTHING in connection with the starting of the Clay Workers' School at the Ohio State University is progressing even better than could have been expected. Enough machinery to establish a complete brickmaking department has been given by manufacturers of clayworking machinery, and already applications have been received from many who wish to join the first class.

MR. CHAS. T. HARRIS, well-known to the building trades of the northwest as formerly a member of the firm of Houston & Harris, Minneapolis, has connected himself with the Central Pressed Brick Company, having charge of their Chicago office. We are confident that Mr. Harris has the best wishes of all the building fraternity in his district, and that they will not fail to remember him when selecting goods.

ARLINGTON Street, Boston, from Beacon to Marlborough, has lately been brick paved, the Interstate Vitrified Brick and Paving Company, 92 State Street, Boston, doing the work. The result has been most satisfactory, and we are not surprised to learn that the city is seriously considering adopting this method of street paving.

The roadbed was prepared by first having six inches solid concrete, on top of which rest one and one half inches plaster cement, — Alpha brand — into which the bricks were set on edge, and all apertures filled to surface with thin cement mortar. The bricks used were made by the Keystone Vitrified Paving Brick Company.

A CHICAGO brickmaker says that the days of the old red brick are passed. A good while ago the brickmaking industry reached its highest perfection in Philadelphia, and the deep red brick of that city were shipped at great expense all over the country, wherever best architectural effects were wanted. But there have been great developments in the art since then, and the pink cream-colored, and bricks of various other hues have supplanted the old red brick in popular favor. This manufacturer says that he can make brick of almost any desired color. He attains this end by mixing with the clay certain metallic substances very finely powdered. He says that he can produce a brick as mottled as a gull's egg; in fact, if you pay your money promptly, the choice is yours. — *Clay Record.*

We cannot agree with the writer of the above article, for while we allow that brick of the various hues that are now being so generally used for fine building fronts has in a large measure supplanted the old red-face brick, we believe it has to a greater extent taken the place of marble, granite, and the various other stones used for fronts. We do not hesitate to say, and our opinion is based largely upon the expressions of many of our leading architects, that, however brilliant the future may be for the colored brick as now manufactured, the good old red-faced brick will always have its place, and be even used to a greater extent in the future. We may draw a comparison with the electric light, which, being the more brilliant, was generally supposed would supplant gas, but, on the contrary, increased the use of gas. People will have light of all kinds because 'tis light, and so people will have brick of all colors because 'tis brick, and we prophesy the red will hold its own.

IF you don't think we believe in advertising, just look at the spread we make in the last issue of *Clay*, the results of which we have begun to realize already.

THAT little patch of brick paving on Back Bay, Boston, is but the forerunner of many miles to come.

Miscellaneous.

PARTIES who anticipate starting in the brick business can form a pretty close relationship with same by reading just one month's issue of brick literature. Well, that is what we are here for.

WE are in receipt of a four-page circular from Messrs Schwencke, Kirk & Co., of New York, which is filled with very flattering testimonials from many of the leading architects on the merits of "Progress" Direct Black Print Paper. Frost & Adams, Agents, Boston.

SINCE the introduction of machine-made mortar in New York City by the United States Mortar Supply Company of 289 Fourth Avenue, it has been almost exclusively used in the finest and most costly buildings being erected in that city, as shown by the following buildings in which it has been used for plastering: Manhattan Life Insurance Company's Building, Home Life Insurance Company's Building, Corn Exchange, and Bowery Banks, American Theatre, The "Life," Schermerhorn, Scribner, American Surety, and Roosevelt Buildings, Buckingham Hotel, Seton, St. Luke's, New York, and Post Graduate Hospitals, Harvard Club, and residences of John Jacob Astor, Elbridge T. Gerry, and W. V. Brokaw. It is also being used extensively for bricklaying.

AMONG the many buildings lately equipped with the "Swinging Hose Rack," Jno. C. N. Guibert, patentee and manufacturer, No. 39 Cortlandt St., New York, have been: Soldiers' Orphans' Home, Normal, Ill; Model Steam Laundry, St. Paul, Minn; Permanent Block, Cleveland, O.; Mississippi Cotton Oil Co., Jackson, Miss.; "Hotel Anthracite," Carbondale, Pa.; Glendale Zinc Co., St. Louis, Mo.; Residence of C. D. Day, Harrison, N. Y.; Providence Athletic Association, Providence, R. I.; Portland Savings Bank, Portland, Me.; Iowa Hospital for the Insane, Mt. Pleasant, Ia.; Notre Dame du Sacred Heart Church, North Adams, Mass.; Purdue University, Lafayette, Ind.; Steamer "City of Lowell," New London, Conn.; Mohawk Valley Cap Co., Utica, N. Y.; Richards Paper Co., South Gardner, Me.; King's Court Apartments, New York City.

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THE BRICKBUILDER

Vol. III. BOSTON, SEPTEMBER, 1894. No. 9.

SAN ZENONE, AT VERONA.

Chapter VI. Continued. "Brick and Marble in the Middle Ages."

A LONGISH walk through squalid suburbs leads us to the open space in front of the noble basilica of San Zenone; it is a desolate, waste-looking space, and the poor, old, uncared-for church looks now as though its day was wellnigh past; as if neglect and apathy were all that men could give now where once they were wont to lavish so much of their treasure and love and art.

The church, as it now stands, seems to have been entirely rebuilt in the course of the eleventh or twelfth century, and its proportions are so very grand, and its detail generally so perfect, that I think it may certainly be regarded as on the whole the noblest example of its class; indeed, except the very best Gothic work of the best period, I doubt whether any work of the Middle Ages so much commands respect and admiration as this Lombard work. There is a breadth and simplicity about it, and an expression of such deep thought in the arrangement of materials and in the delicate sculpture, which with a sparing hand is introduced, that one cannot sufficiently admire the men who planned and executed it. Beyond this the constructive science was so excellent and so careful, that with ordinary care such a church as San Zenone would seem still likely to last for ages.

The view of the west front is certainly very striking. The whole church has been singularly little modernized. By its side to the north is a fine simple red brick tower, I suppose originally belonging to the city walls; behind and near the east end of the church, but visible here, the tall and much-arcaded campanile; and on the other side the little church of San Procolo, with a fourteenth-century painting of our Lord under a gabled canopy overhanging the doorway. The west front of San Zenone is simple but dignified. The nave and aisles are finished with cornices following the flat pitch of the roofs. The walls are divided by many vertical lines of pilasters which rise from the plinth to the eaves-cornice. The main part of this front is stone, but a good deal of marble is used; *e. g.*, the rose window has tracery of red marble enclosed within an order of white marble, the doorway and sculpture are in white marble, once much enriched with color, and the arcaded band all across the front is of red marble. Add to this that the stone used is all of an extremely warm yellow color, and an idea may be formed of the effort that was made here in the principal front (as often in Italian churches) to show that God's house was the noblest that could be built.

The doorway well deserves a chapter to itself. Its lintel has illustrations of the labors of the twelve months; its jambs, subjects on the right from the Old Testament, on the left from the New. In front of this door there are detached shafts standing on monsters and supporting a low canopy. An inscription on the façade, "Salvet in eternum qui sculpsit ista Guglielmus," gives the name of the sculptor, the same man probably who, about the middle of the twelfth century, sculptured the western doorway of the cathedral at Modena. No less worthy of study are the bronze doors of this doorway. Here, as is so often the case in mediæval Italian works, we have the names of the artists employed — Guglielmo and Nicola da Figarola — with the pious expression of hope that he who sculptured the work might be saved eternally. The subjects are very rude in their detail; they illustrate subjects from the Old Testament, and are executed in thin plates of bronze nailed on to the wooden doors. A row of small windows, one in each of the many divisions of the front, extends all across near the top of the porch; whilst above is a large circular window, filled in with wheel tracery, and treated, as was not uncommon, as an illustration of the wheel of fortune. Round this window is an inscription explaining its symbolism.

We went first into the cloister on the north side of the nave. The arches are very small, and of brick, supported on coupled shafts of red Veronese marble, which have marble caps and bases, and rest on a dwarf wall of stone capped with a thin course of marble. The arch bricks are of a rich red color, and contrast well with the brickwork, of the ordinary kind above them; they are used without any kind of moulding or ornament — and yet I doubt whether I have ever seen a more lovely cloister than this. The arcades on the north and south sides have round arches; those on the east and west are pointed; and on the north is a projecting arcade, of the same detail, which once formed the lavatory. The whole of this cloister is in a very sad state of filth, neglected and unused, and will, I fear, erelong become ruinous.[1]

From the cloister you enter by a side door into the north aisle of the choir; much better, however, would it always be to enter from the west, for it is there, when standing at the top of the flight of ten or twelve steps which leads down from the door to the floor of the nave, looking down the great length of the church, scanning its singular perspective of timber-roofing, the great height and simplicity of its walls, and the mysterious view down into the crypt, under the choir, through the recently opened arches, that one feels most deeply the great and religious effect of the church. To an eye used to northern Gothic there is something very new in such a building. Its shape, its material, its arrangement, are all unlike what an English eye is used to, but I cannot say that I paused for an instant in doubt as to whether I might really admire or not; for I felt, at once, how very good the work was, not only in its general effect, but as much in the treatment of the details, in its color, and in its arrangement.

The general plan is very simple — a great parallelogram divided into a nave of vast width, with northern and southern aisles. the aisles terminated with square east ends, the choir with an apse of five bays, which is, however, of later date than the rest of the church. The chief singularity in the design is the division of the piers of the main arcades into primary and secondary — the first being large, heavy piers supporting great arches spanning the nave and aisles, which are finished in a line with the top of the walls; and the latter more deli-

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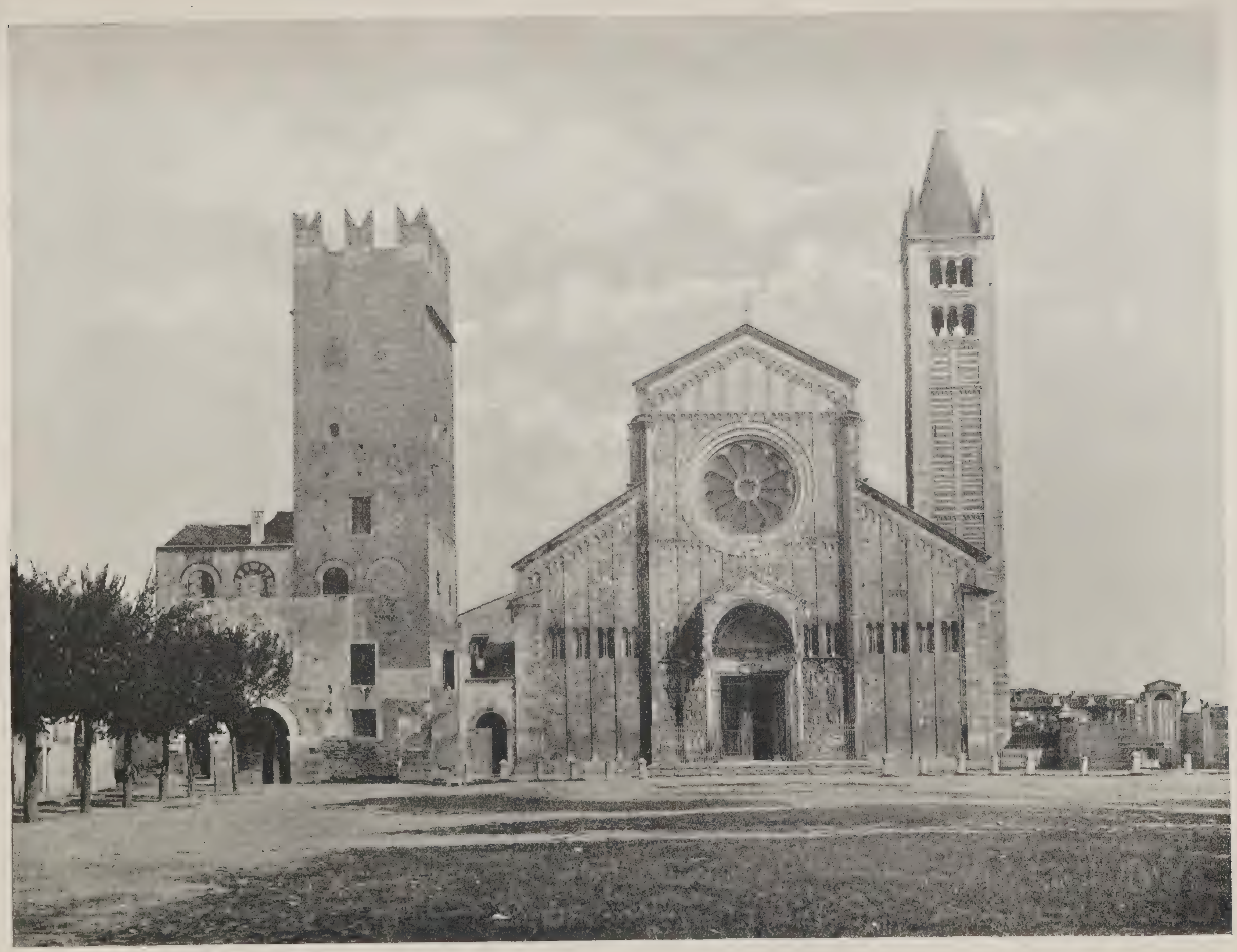
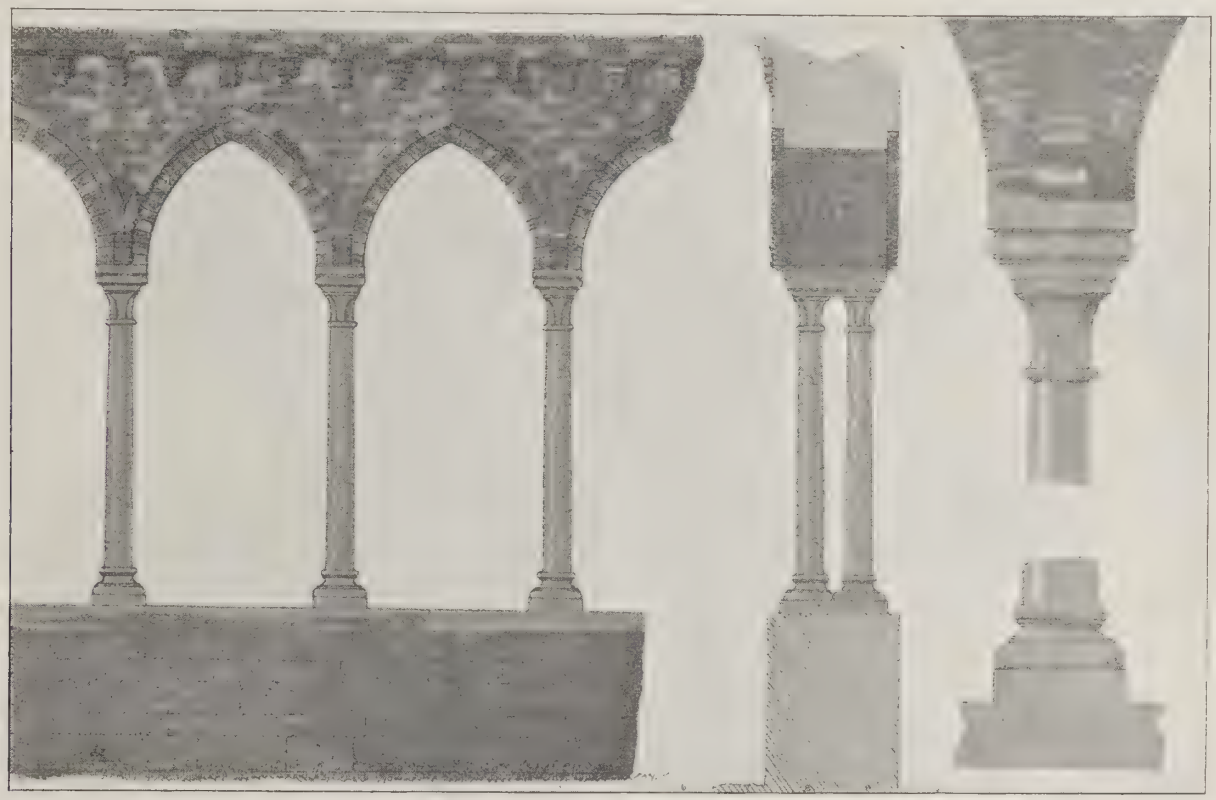
[1] This cloister is said to have been built in 1123. This is, I think, at least, fifty years earlier than its real date.



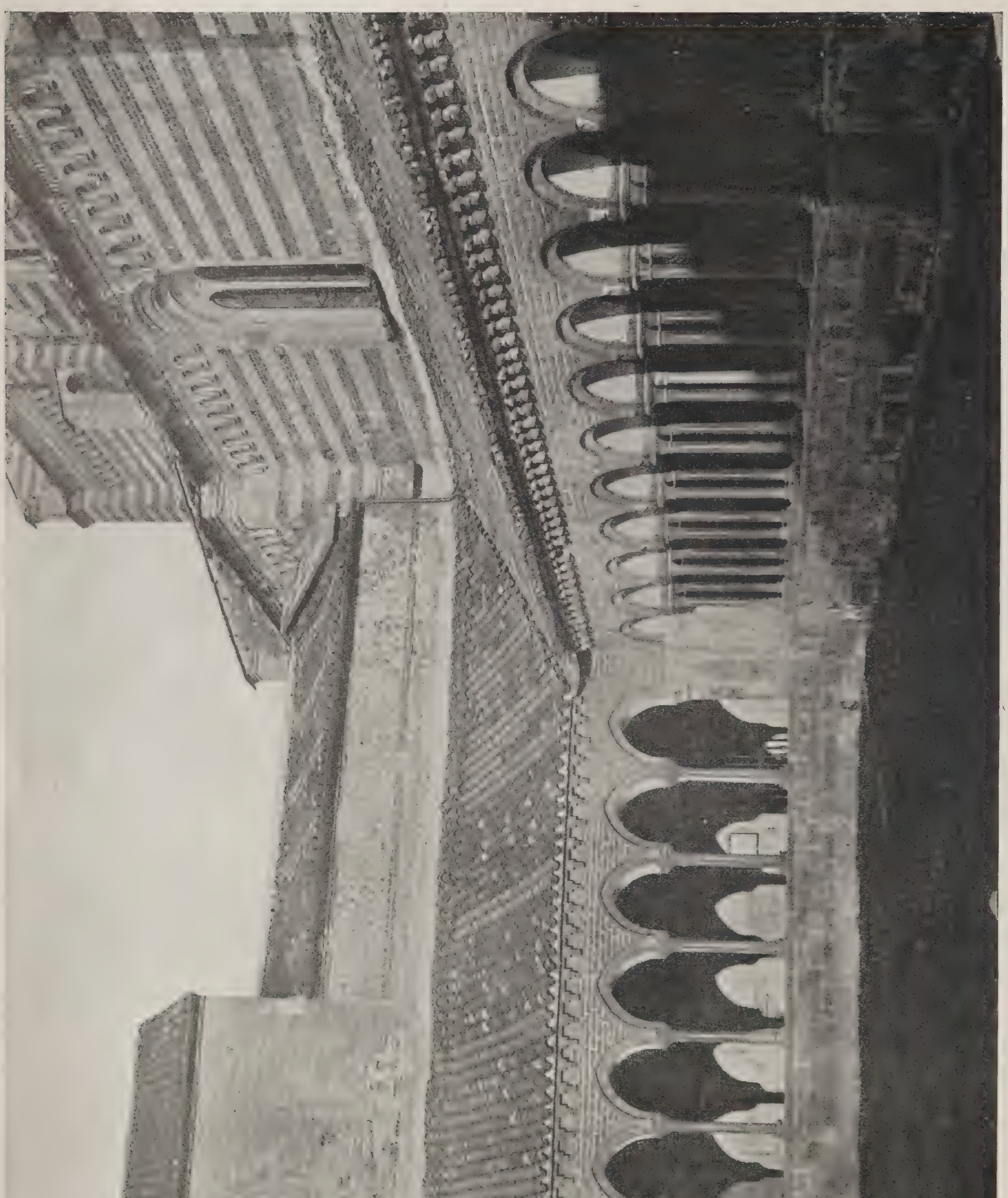
VIEW OF THE WEST FRONT OF SAN ZENONE, VERONA. Supplementary Illustration to "Brick and Marble in the Middle Ages."

cate, circular marble columns of very classical character, with finely carved capitals, and looking almost too slight to support the vast height of clerestory wall which towers up above the arcade which they carry. The timber roof, or ceiling, is curious; the framing is all concealed, with the exception of the collar-beams, which connect the points of the trefoil which forms the internal line of ceiling. This trefoil outline is all boarded, divided into panels, and painted. The effect of this great length of panelled roofing, partly concealed by the great arches which cross the nave, is certainly fine. The wooden roofs of the aisles, too, are original, and their beams are painted very much like the Austrian sentry boxes, in zigzag lines of black and buff. Much of this painting, however, did not appear to me to be old.



ELEVATION, SECTION, AND DETAIL, CLOISTER OF SAN ZENONE, VERONA.

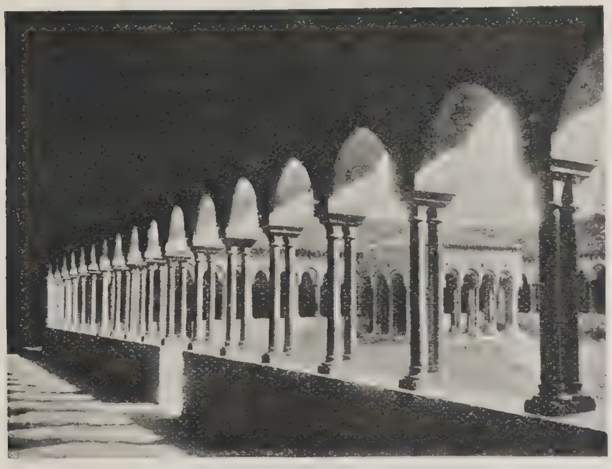
At about two thirds of the length of the church, between the west door and the apse, it is cut in two, so to speak, by that which perhaps is now the greatest charm of the interior— the crypt. When I first visited San Zenone this crypt existed, but its existence was not realized from the nave. The only access to it was from the aisles, and even here the arches were partially blocked up. A flight of steps across the whole east end of the nave led up to the choir, and concealed the old entrance to it. This, it has lately been found, was originally formed by three open arches from the nave with a flight of steps descending under them to the level of the crypt, whilst two arches on either side of these gave access to it from the aisles. This is the old scheme, and the only possible approach to the raised choir must originally have been that which has now been restored, viz., two narrow flights of steps against the side walls, so contrived as not to interfere with or conceal any part of the sculpture or other decorations on the western face of the arches to the crypt. The church, as now restored, yields to few with which I am acquainted in the solemn effect which is the result of mysterious light and shade, multiplied vistas of columns and arches, and picturesque originality of design. It is evidently rather a result of growth than of first intentions. The crypt — like our own remarkable example at Wimborne — seems to be an insertion. The columns and piers of the choir pass on into the crypt, whose piers and vaults are built against them. There is an obvious difference too in the style of the church and of the crypt, showing that at least a hundred years must have elapsed between the erection of the former and the insertion of the latter. The choir now occupies the three eastern arches of the old constructional nave, and beyond this has a square bay and a five-sided apse, the two last divisions being groined and decorated with a good deal of color. The apse is of the fourteenth century, but all its windows have been modernized. The crypt follows exactly the dimensions of the choir, but is divided into no less than nine bays in width and six bays in length, exclusive of the apse. The red marble columns which support its groined roof are all monoliths, delicate in their proportions, and many of them probably antique. The vaulting is quadripartite, and there are considerable remains of wall paintings, which appear to be nearly coeval with the crypt. In the centre of this crypt is the shrine of San Zeno, half concealed by the gloomy but effective lighting, and surrounded by a metal railing made of quatrefoils, buckled or tied together, very much in the same style as the railings round the Scaligeri monuments. The altar in this crypt is worth notice on account of its sculptured front. This has in the centre a small crucifix with SS. Mary and John, and on either side, under arches, figures of the Evangelists. The face towards the nave of the seven arches which form the western part of the crypt is decorated with extreme care and finish. They are admirable examples of the really polished work of the Italian artists of the end of the twelfth century. The arches from the north aisle deserve special notice. They are carried on coupled shafts which, as well as their capital, are of red Veronese marble, the archivolt being of stone. The section of both shafts is circular, but one of them is delicately twisted to a spiral curve on its upward course. The refinement of this treatment of shafts is very characteristic of the best Italian work, and this coupled shaft, simple as its treatment is, and common as are the elements of its design, is so beautiful that it makes a real sunshine in a shady place. Not less are the arches above it worthy of admiration. The sculpture here, of a trailing branch of foliage, is very slightly relieved, but its outline is so graceful, its imitation of nature so close without being merely realistic, and its fitness for its position so complete, that I think I have never seen anything



CLOISTER OF SAN ZENONE, VERONA. Supplementary Illustration to "Brick and Marble in the Middle Ages."

in its way more satisfactory, and certainly never anything really ornamental in the best sense, the elements of which were more severely simple.[1]

The color of the whole interior is, to my mind, charming. It was first of all built in alternate and very irregularly divided courses of brick and stone. On this warm-colored ground one pious man after another came and painted what seemed to him best, — a Madonna, a crucifixion, a saint, or a group of figures, — with not much thought beyond that of making the particular work in which he was interested tell its own story well, and produce its own effect. So little did he think of other men's previous work that the same subjects are not unfrequently repeated. The result is that the walls were here sober and there gorgeous, but everywhere colored and everywhere more or less interesting. Yet the materials of which they are built are just those which we see every day of our lives, and it was the skill of the workman, not the richness of his materials, which made his work so worthy of our admiration.



CLOISTER OF SAN ZENONE, VERONA.

Supplementary Illustration to "Brick and Marble in the Middle Ages."

Only one portion of the church is decorated upon a regular system; this is the eastern part of the choir and the apse, which has part of its walls and its groining very elaborately painted though with but little gold; the groining ribs are richly colored, and on each side of them is a wide border, generally subdivided into regular geometrical figures, and the spaces between these borders are painted blue and powdered with gold stars. In the south aisle is an altar under a baldachin, supported at the angles by four clustered shafts knotted together in midheight, — a capricious custom of which Italians seem to have been especially fond, and the only excuse for which, so far as I can see, is that it proves that all the shafts were cut out of one block, and therefore of more value than four plain detached shafts cut out of separate blocks could be. There is perhaps, also, a relief to the mind after looking at a long series of similar shafts, to come at last upon some one or two marked by capricious singularity such as this. Be this, however, as it may, the eye certainly always feels inclined to admire them, though the reason is never quite satisfied; and perhaps some better excuse does exist for their use than I have as yet been able to discover. It is probable that these columns belonged originally to the baldachin over the high altar. The canopy which they now support is not old.

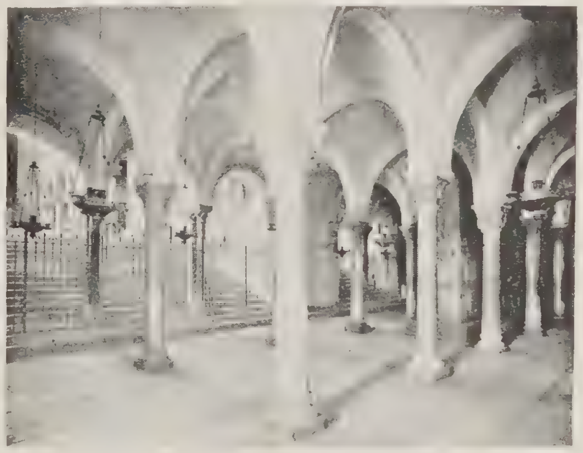
The vestry on the north side of the choir is worth a visit, if only for the sake of its prettily panelled and painted ceiling. Here the panels are very small, and left in the natural color of the pine, and the ribs are decorated with white, red, and black. There is also in this room a very good fourteenth-century marble cistern and lavatory under an arch in the wall; and lastly, in the wardrobes, among many things not worth seeing, a finely embroidered bishop's mitre of the twelfth century, wrought in gold on linen. In front is a figure of our Lord, at the back one of the Blessed Virgin, with emblems of two Evangelists on each, and a band below with figures of the Apostles, the stoles also being adorned with figures. The arrangement of the choir shows the common Italian plan of stalls round the apse behind the altar. They are of early Renaissance character, with some relic of Gothic feeling in the traceries of the backs and elbows. There is also a good example of a square choir lectern, with a large base to contain books, and a revolving gabled desk.

Until the beginning of this century there were only two altars in this church, one in the choir, the other in the crypt. The verger told me that his father remembered the other altars being brought from a suppressed church, and erected here.

The campanile is well seen from the cloister, where it composes finely with the coursed walls of the church and the many shafted arcades of the cloister. It is a lofty square tower of several stages, with small pinnacles, and a low circular brick spire crowning it.

I must not leave San Zenone without mentioning the construction of the exterior, which — with the exception of the west end, which is of stone and marble — is entirely of red brick and very warm-colored stone. The courses of stone are, as a general rule, of about the same height, whilst those of brick are very varied, some only of one course, others of four or five. The cornices at the tops of the walls, too, are very good, supported upon corbel-tables with round arches resting upon corbels, and much improved in their effect by the judicious introduction of thin deep-red bricks between the courses of carved stone, which are thus thrown out forcibly. It is in this use of red brick, and in the bold and successful way in which brick and stone are shown in the interior, that this church is so full of instruction to an English eye; and I could not see such a work without regretting bitterly the insane prejudice which some people indulge against anything but the cold, dreary, chilling respectability of our English plastered walls, which to me seem to be fit only for occupation by savages.

Every time I visit this noble church I leave it with greater regret; its exceeding grandeur appears to deserve a better fate than the spare use to which it seems now to be abandoned. To see all these painted or colored walls, all these marble piers, and all this vast expanse of wall and roof waste and desolate, apparently not half used and never filled with a throng of worshippers, reminds me too strongly of the sad and similar fate of some of our own English churches not to awaken a sigh as I look at it. To some men it is a comfort to find that their neighbors are no better than themselves in these matters, but I confess that to my mind a great church disused is a subject only for mournful recollection, just as a noble church much used and filled with crowds of worshippers is an object for emulation and admiration. Here, in good truth, I know not where the worshippers are to come from, so decayed and forlorn is the neighborhood.



CRYPT OF SAN ZENONE, VERONA.

Supplementary Illustration to "Brick and Marble in the Middle Ages."

(*To be continued.*)

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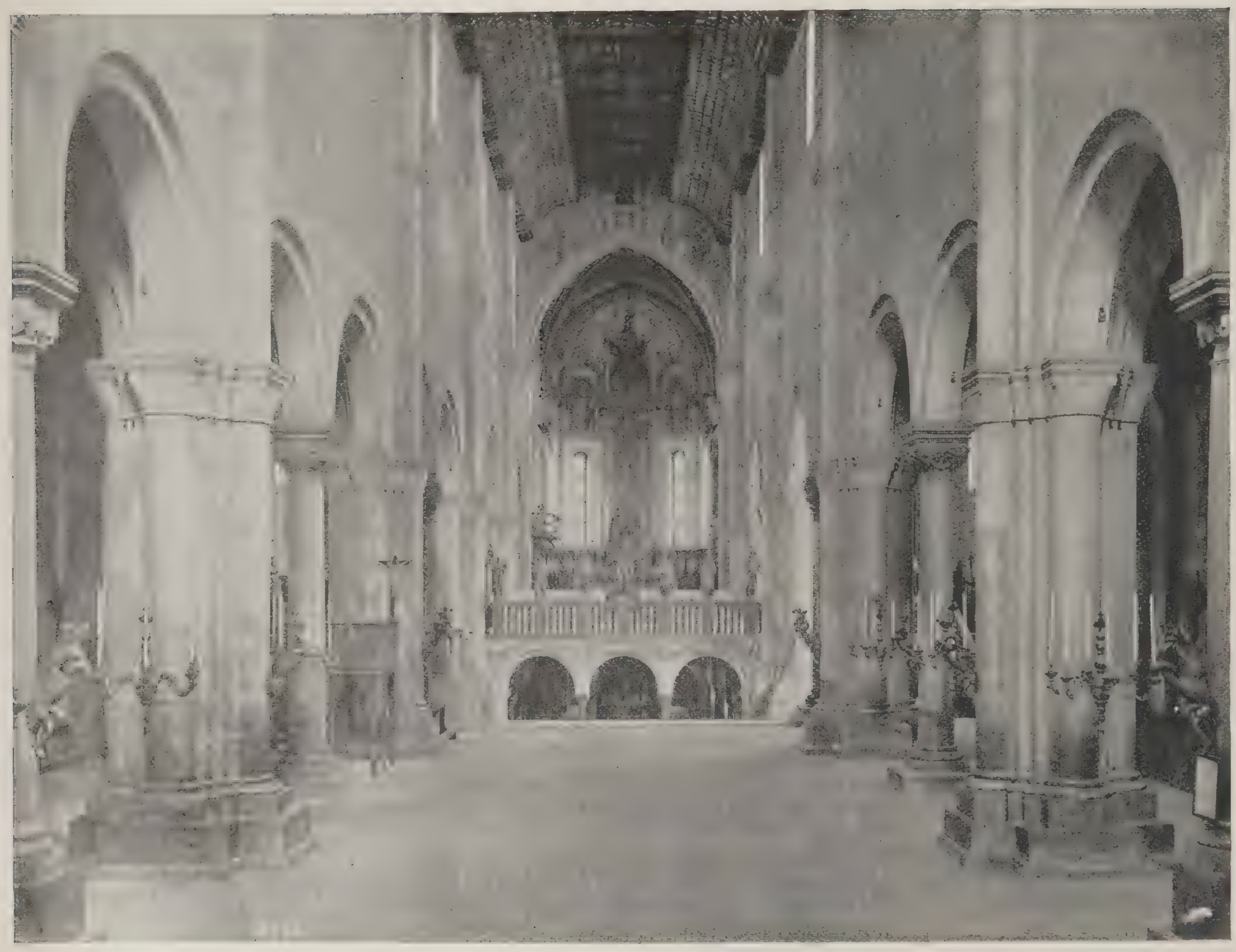
[1] The sculptor of this same work left his name — Adaminus — on the capital.



INTERIOR OF SAN ZENONE, VERONA.
SUPPLEMENTARY ILLUSTRATION TO "BRICK AND MARBLE IN THE MIDDLE AGES."

THE length of our article on "Recent Brickwork in Cincinnati," and the number of illustrations with it, forced us at the last moment to omit our regular instalment of the "Art of Building Among the Romans." It will appear as usual next month. Portland, Ore., is next to be considered under our department of "Recent Brickwork in American Cities," and St. Louis, Detroit, and Baltimore will follow in turn. A strong article, advocating brick in ecclesiastical work, by Ralph Adams Cram, will be the leader for October, and "San Fermo Maggiore in Verona" will make a good second. Under "Fireproofing" we expect to give the first of several papers by Mr. George E. Hill, of New York, on the strength of fireproof floors as determined from some eighty tests.

EDEN PARK STABLE. W. M. AIKEN, Architect.

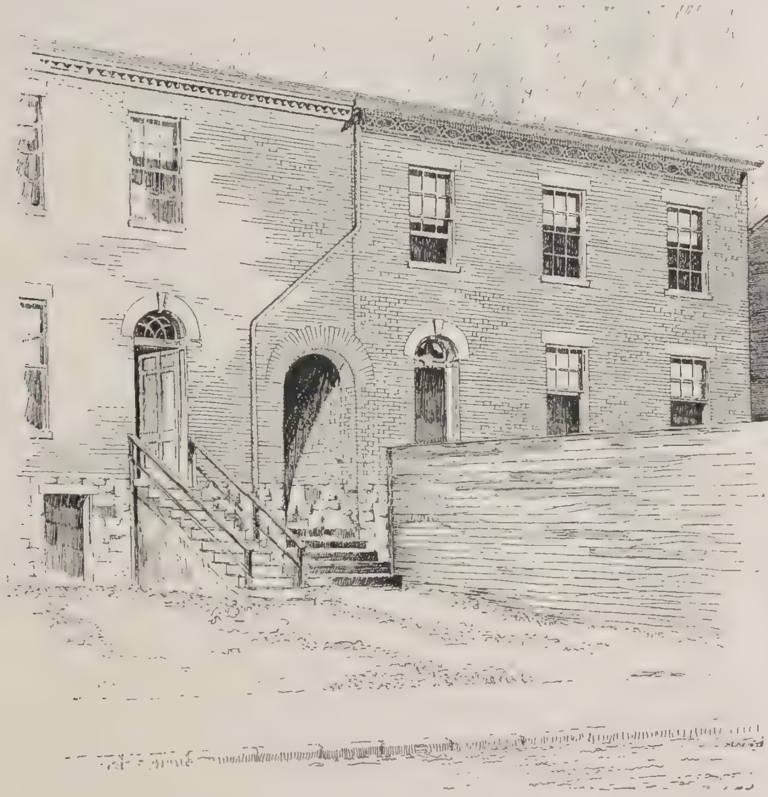
EDEN PARK STABLE. W. M. AIKEN, Architect.

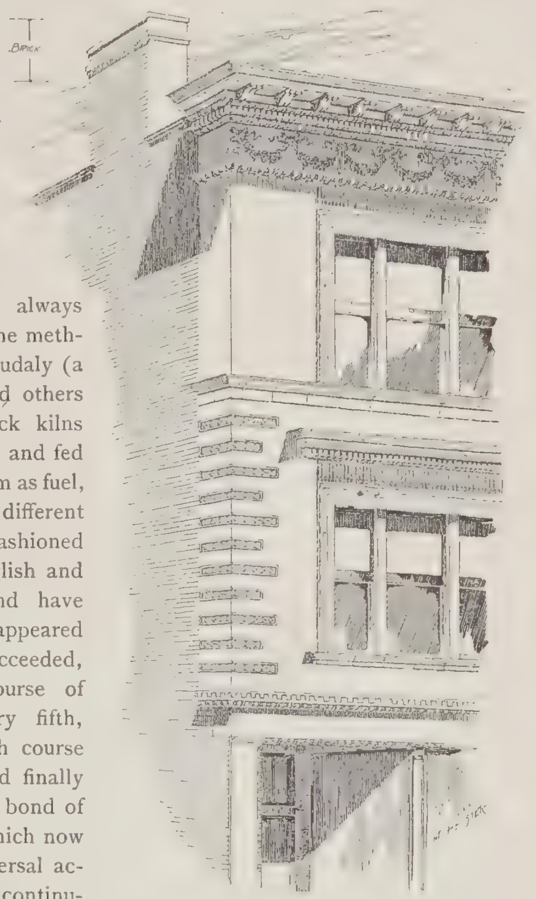
RECENT BRICKWORK IN AMERICAN CITIES

CINCINNATI.

THE original name of Cincinnati was Losantiville, "the city opposite the mouth of the Licking." Its situation on the Ohio being, moreover, between the Big and Little Miami Rivers, and with Mill Creek as an additional water-course, might lead a casual observer to suppose from analogy (by comparison with the cities of Northern Italy, for instance) that it is a city of brick buildings. It is interesting to note its topographical outline, which is somewhat similar to the shape of the left hand; the business portion being represented by the palm, the space between thumb and forefinger being occupied by Mill Creek Valley, and the other spaces defiles giving access to the suburbs on the hilltops; the thumb and fingers may suggest, in their order, Price Hill, Clifton, Avondale, Mt. Auburn, and Walnut Hills, a curve of the river completing the outline from ball of thumb to knuckle of little finger.

Although there is much brick made in Mill Creek Valley, as well as near the mouth of the Big Miami and elsewhere, yet the sides of the defiles above referred to yield large quantities of a blue fossiliferous limestone, loosely stratified with clay. There are also many quarries of sandstone within a comparatively short distance of the city. Besides this, with the increased use of the cable or electric car service as a means of rapid transit, and the inducements for ownership offered by the building and loan associations, many portions of the suburbs have grown up almost entirely of frame buildings. Partly from the inroads of business into the resident streets, and partly to escape from the dirt and soot of the city, many families have deserted the city proper and built farther away from the river. In this change much of the oldest brickwork has disappeared, to be replaced by commercial buildings of stone and iron.

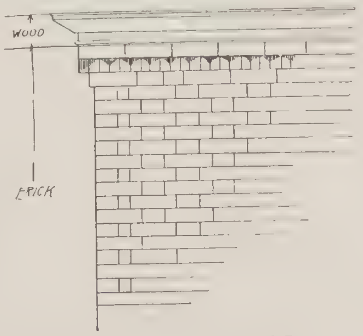




STORE BY RIEG & MARTY. (See Plate 66.)

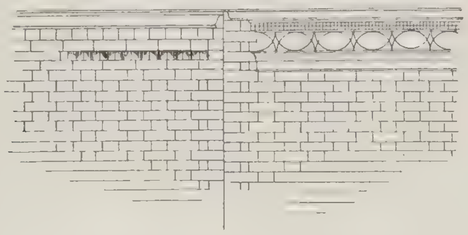
The great majority of this work has been done within the past twenty-five or thirty years, and in that time not only have the requirements of building modified the design, but the way in which brick is laid is no longer the same, nor is it always made by the same methods. W. A. Eudaly (a Cincinnatian) and others have devised brick kilns circular in shape, and fed by crude petroleum as fuel, which are vastly different from the old-fashioned affair. The English and the Flemish bond have each, in turn, disappeared long ago, to be succeeded, first, by the course of headers to every fifth, seventh, or ninth course of stretchers, and finally by the American bond of blind headers, which now finds almost universal acceptance. The continuous decline in the price of structural iron, and the demand for office and apartment buildings coincident with the appreciation in value of business property, are here, as in certain other cities, the main causes which have contributed to the differences between the old and new kinds of building.

One of the typical residences of the early days of Cincinnati is the old Whittaker house (see Plate 65), built about seventy-five years ago and still standing, facing the river, on Eastern Avenue. The brick is laid with alternate headers and stretchers throughout; the window-heads are flat arches; the front door has a half-round head; the cornice has a course of brick set diagonally and finishes with a moulded wooden gutter next to the low-pitched shingle roof; the window-sills are all of wood. Not far distant stands another building of the Whittaker estate, which shows successive changes in various details: it has at one time been enlarged, the two parts being separated, on the ground floor, by an open archway; this is the only brick arch, the two others of the front being of stone (in three pieces), as are also the lintels and sills of the windows. One portion shows a cornice similar to that above mentioned, the other has a wooden entablature of nice proportion and refined detail. With the rare exception of the occasional use of a quarter-round as a water table, moulded brick does not seem to have been used in this locality; the cornices were almost

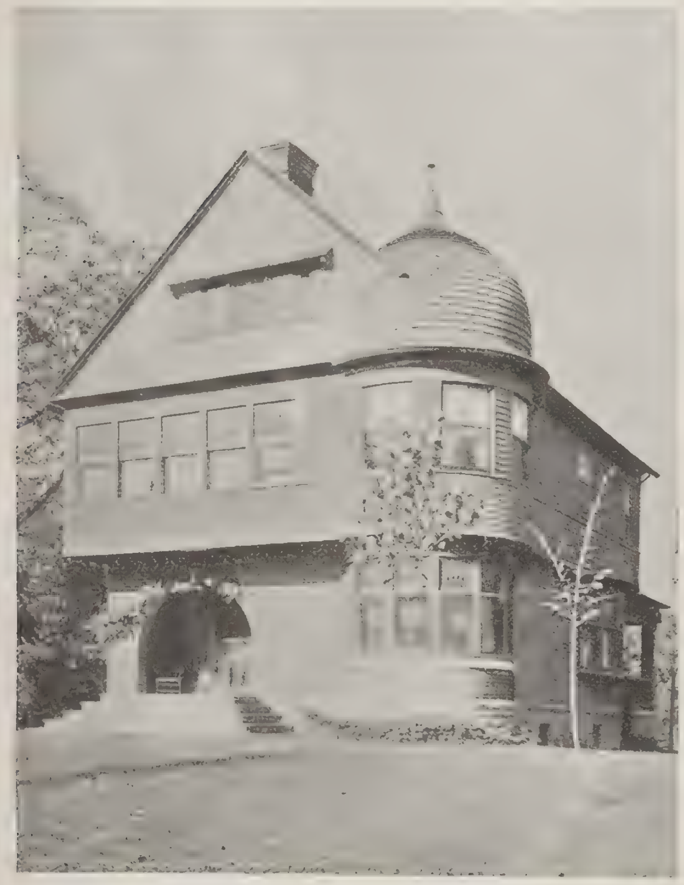


DETAIL OF CORNICE.
WHITTAKER HOUSE.

always of wood, and many of them quite interesting. The old Burnet residence, which formerly stood on the northwest corner of Seventh and Elm Streets (removed in 1885), was rather an elegant house in its day, standing on a high basement, with porches in front and rear, having slender columns of wood and railing of iron. The Lytle house is still occupied by descendants of the family, though it no longer fronts on Third, but on Lawrence Street, as the space once used for lawns and gardens has long ago passed into other hands and been built upon; this house is interesting chiefly on account of its proportions, plan, and interior details. The Dexter house (now occupied by the University Club), designed by J. R. Hamilton, an English architect, about 1855 or 1856, was built of Eastern pressed brick, of a soft, smooth texture, and grayish-red color, laid with joints an eighth of an inch thick, and was among the first where blind headers were used.



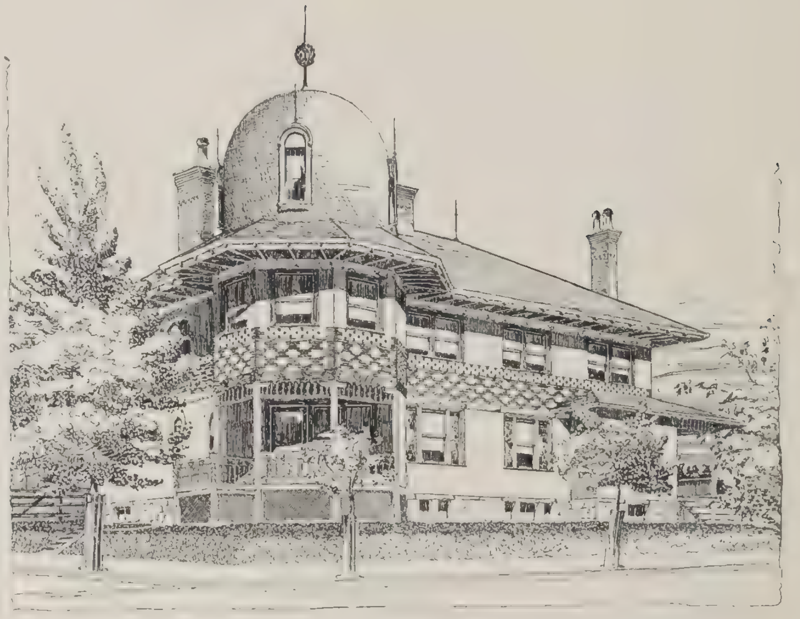
DETAIL OF CORNICES



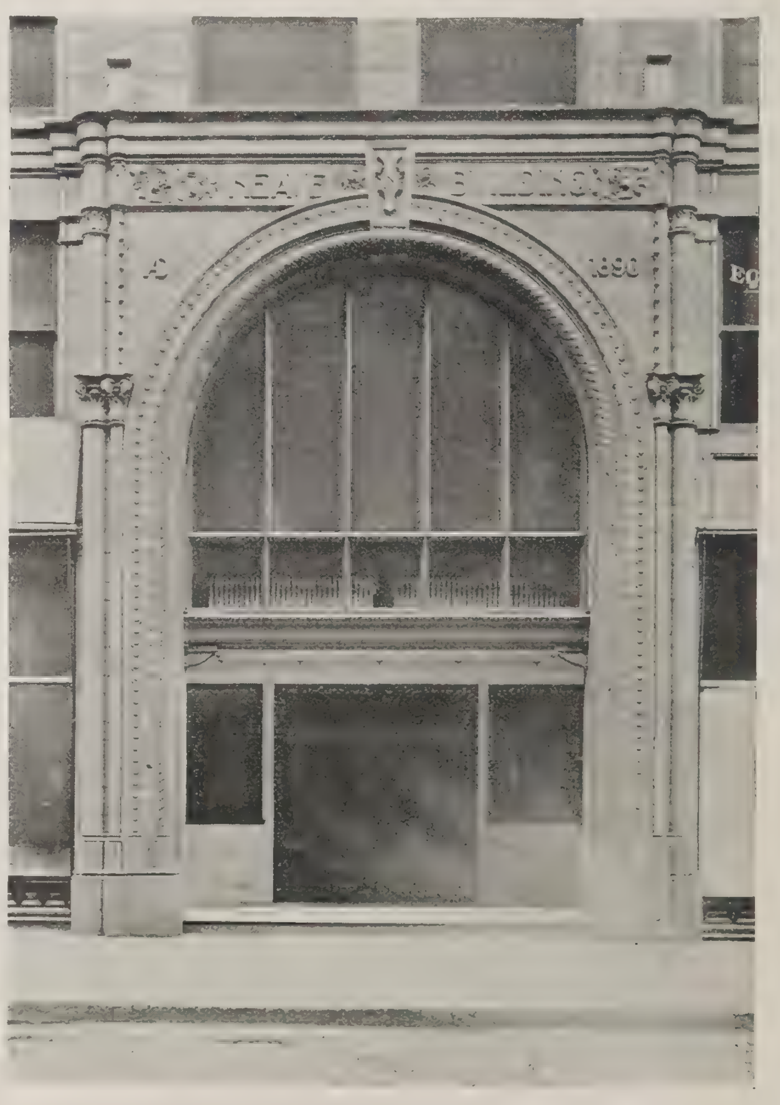
RESIDENCE OF F. A. PRICE, AVONDALE. L. F. Plympton, Architect.

One of the oldest public buildings of brick is Christ Church, built about 1853; the front is said to be a reproduction of an English church; there is, however, no relation between exterior and interior, or elevation and plan, there being neither columns, clerestory, nor any suggestion of nave and aisles inside, and the tall perpendicular window of the façade being much higher than the Tudor vault back of it.

Among the very largest commercial buildings is the dry-goods store of the John Shillito Company, built by James W. McLaughlin in 1877; it is quite simple, with large rectangular piers and openings and cornice of modest projection. The Cuvier Club and the Spring Grove office building have a greater proportion of stonework in the trimming and are more ornate, though much smaller than the Shillito building. In these three Mr. McLaughlin has used red face brick; but in the First National Bank he has tried a chocolate colored brick, relieved by caps and sills — with occasional mullions and transoms — of red Iowa sandstone; and he is just now completing the ten-story Rawson building, where a framework of iron is encased in terra-cotta and brick,



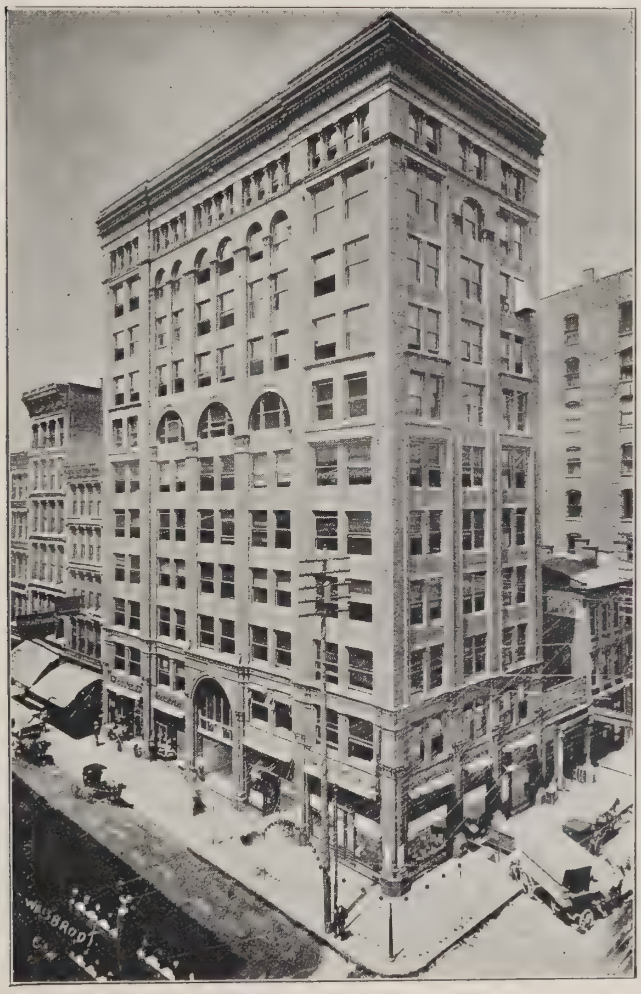
DOUBLE HOUSE, MT. AUBURN. L. F. Plympton, Architect.



NEAVE BUILDING ENTRANCE. A. O. Elzner, Architect.

both floors and walls; the color here is a warm pinkish buff, the brick and terra-cotta matching closely. In the vestibule of the Art Academy and in a corridor of the Ætna Insurance Co.'s building he has made use of glazed brick in various colors, a material seldom recognized here.

The most elaborate piece of brickwork in this section of the country is Music Hall, with its wings (for art and machinery exhibits), its towers, gables, dormers, bay-windows, cornices, balconies, and loggias. The "Ortiz" and "Alta" apartment buildings were, like Music Hall, built by Samuel Hannaford, and these two show the first use of moulded brick to any extent in Cincinnati. In the First Regiment Armory there is much corbelling of red brick on the front, and in the Phœnix Club buff brick is being used with buff terra-cotta quoins and stringcourses, red and gray granite columns and galvanized iron cornice.



NEAVE BUILDING. A. O. ELZNER, Architect.

Des Jardins & Hayward have used some moulded brick in a double house facing Eden Park, also in a single house (which has rather a flamboyant feeling) on Park Avenue, and again in another at the corner of Fairfield and Madison Avenues: the first and second are dark red; but the last is almost white, and with larger wall spaces, more concentrated ornament, and superior location, it is the most admired of the three.

A little store of twenty-five feet front on 7th Street has two stories of buff brick and terra-cotta so nicely proportioned and detailed that the architects, Rieg & Marty, have created a refreshing oasis in the desert of its dreary surroundings. (See page 177 and Plate 65.)

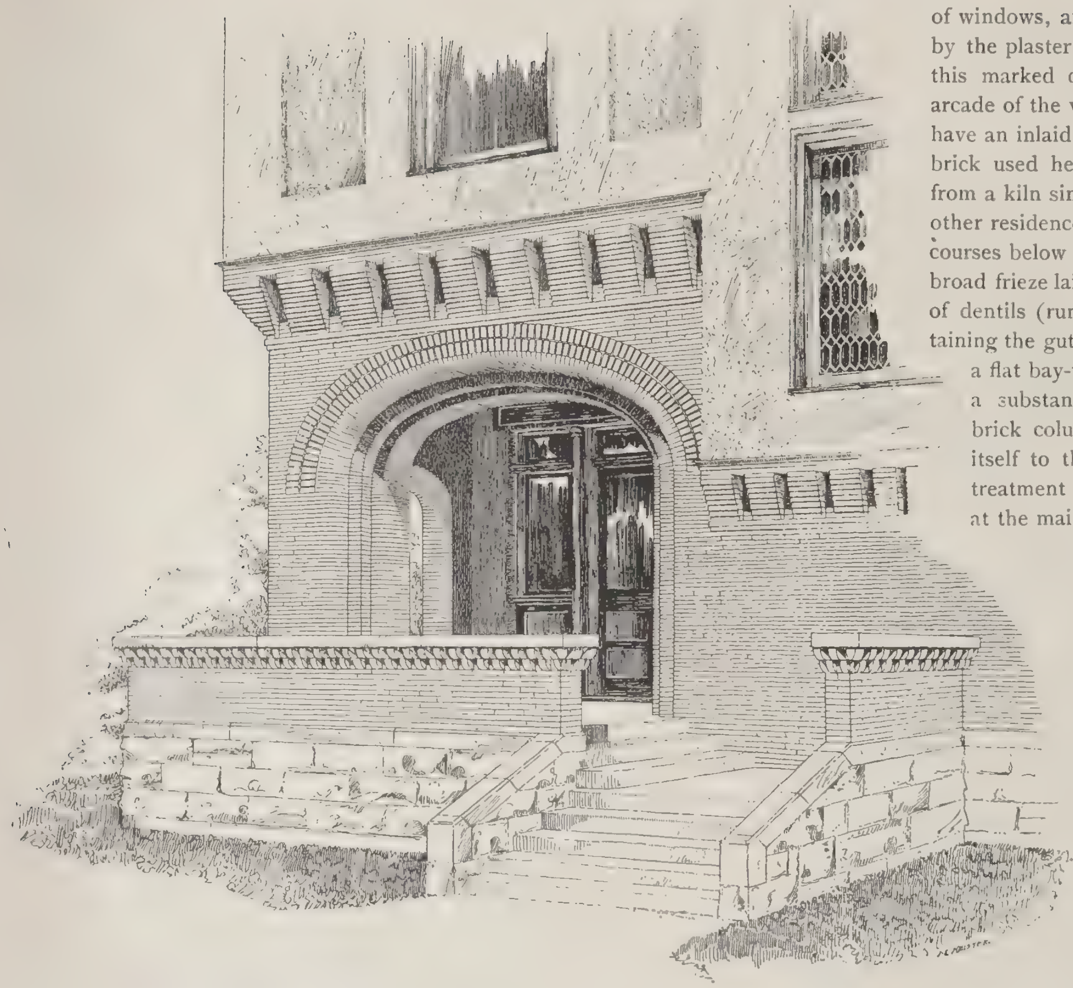
The Neave building was the first to be erected in this city with the skeleton fireproofed construction, and is of salmon-colored mottled Roman brick and pink terra-cotta trimmings, with a large ornamental arched entrance and deep cornice of the same material. A warehouse (see Plate 68), also by A. O. Elzner, is of common brick, with two Ionic columns of light terra-cotta at the main entrance of first story; tall arches, running up through four stories, enclose triple windows, above this is a frieze of smaller rectangular openings, and then a broadly projecting roof of very slight pitch. Another factory shows a plain wall without any grouping of windows except at one end, next the staircase, but it finishes with quite an elaborate brick cornice. A third, with a front mainly of pressed brick, has the first story of sandstone with columns at either side of the entrance, quoins of the same stone in the second and a cornice (having dentils, carved bed-mould and modillions) of wood surmounting the sixth story. A suburban store, by the same architect, has a large picturesque brick dormer as its principal motif, but its chief attraction lies in the combination of color; brown mottled Roman brick, with trimmings of red moulded brick and red sandstone, being relieved by the blue-gray slate of the roof and dark bronze green of the iron work in first story. (See page 182 and Plate 66.) With a corner loggia of pressed and moulded brick, still further enriched by some carved stone, he has given a point of considerable interest to a house which is otherwise very simple. (Page 191 and Plate 66.)

Another one, by L. F. Plympton, all in gray mottled Roman brick, is built in alternate courses having squared or rounded corners, supplemented by a small terrace, with parapet and steps (the latter of a cool greenish-gray stone), and surmounted by brick corbelling of the second story in buff and drab plaster.

There is a little cottage in Avondale of brick, shingles, and plaster, which Mr. Plympton designed some time ago, the first story of which is worthy of more than passing notice to any one interested in brickwork. A rough, sand-struck, grayish-red brick is laid in fine, very white mortar, the thick joints are weathered down and out (giving sharp, clean horizontal lines); the circular corner bay shows headers throughout, but elsewhere the bond is made by laying three stretchers to one header, seriatim, *in each course*. (Page 178.)

DES JARDINS & HAYWARD, Architects. (See detail, Plate 67.)

In a double house on McGregor Avenue he has introduced between the first and second story windows a wide band with narrow border of diaper, or mosaic, the tints for which were obtained by culling out the extra light and extra dark from the same kiln, of common sand-struck brick, which furnishes material for the remainder of the house. (Page 178.) In the Tenth District schoolhouse facing the canal, he has used a brownish, rough gray brick, with stone trimmings



FRONT ENTRANCE, RESIDENCE OF WM. A. GOODMAN, E. WALNUT HILLS.
NASH & PLYMPTON, Architects.

of a much lighter gray, a deeply overhanging roof of dark blue slate, with red tile hip rolls, showing what may be done with inexpensive materials — and some thought. There is also a brick schoolhouse in Cumminsville (one of the suburbs) designed by Edwin Buddemyer, a former partner of Mr. Plympton, though it bears a marked resemblance to Sever Hall, Cambridge.

Since the erection of these, H. E. Siter has designed the schoolhouses for the city, and among them are several examples which show a decided improvement over the schoolhouse of past generations. In some of his factories and warehouses, by putting study into the cornices, grouping the windows and emphasizing the piers, he has redeemed them from the commonplace.

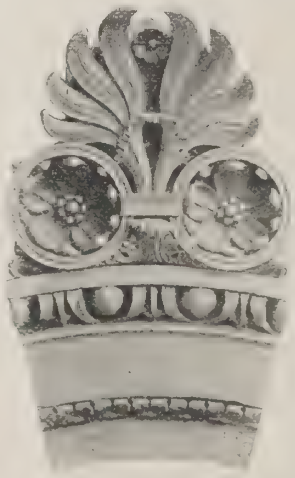
With suburban residences, W. W. Franklin, who is an Englishman and has had English training, has produced some picturesque effects; heretofore his preference seems to have been for stone, wood, or plaster, but lately buff brick is his chosen material.

In a greenish-gray stone and buff brick veneered house, George W. Rapp has built an attractive home for his brother-in-law; another and larger one of dark red brick, with red sandstone trimmings, is a decided improvement to Avondale, which suburb has perhaps changed or the better more than any other in the past ten years. (Page 192.)

Opposite the entrance to Eden Park, on Gilbert Avenue, stands an unpretentious building, designed by Wm. M. Aiken, for the park trustees. The foundations are of local blue-stone coursed masonry; two courses of moulded brick with one plain course form the watertable, stepped in offsets at the openings as the grade changes; the same moulded brick, without the intermediate plain course, finishes the brickwork at the level of window-sills, except on the front corners, which are defined by piers; common, rough, reddish-brown brick is used laid in red mortar, with sunk joints, to Flemish bond, the headers being of bench brick. (Page 176.) A residence on Price Hill is noticeable chiefly for the expanse of wall surface, breadth of windows, and the additional sense of repose gained by the plaster frieze and hipped roof; as a contrast to this marked quietness, those openings in the little arcade of the west end, which are not filled with glass, have an inlaid mosaic of brown and red bricks. The brick used here were smooth, dark red, dry pressed, from a kiln since then abandoned. (Page 192.) Another residence on Walnut Hills has projecting stringcourses below and above the second-story windows, a broad frieze laid in Flemish bond, and a double course of dentils (run through solid under the dormers) sustaining the gutter: this dentilling is reiterated beneath a flat bay-window on the side of the second story; a substantial-looking front porch, with moulded brick columns and caps, and red tile roof, allies itself to the central dormer above it by a similar treatment of arches in each feature, where, as also at the main corners of the second story, a quirked bead is used. The same architect, in designing the building for an electric light and power station, has made the stack twelve-sided, allowing the bricks to cross each other in alternate courses at the angles, instead of cutting them; the top is gradually expanded, and changes from polygonal to circular by a series of long, slender corbels and arches, and then reduced again, in the round, to a smaller diameter by a conical stone coping.

Of course in this city of three hundred and fifty thousand inhabitants there must be many brick buildings, such as breweries (of which there is about one to every ten thousand of population), churches, railway stations, etc., etc., which have not been mentioned, and some of them worthy of notice; but in a magazine article it is hardly possible to do more than mention a few of the more prominent examples, leaving to others the pursuit of further investigation should their interest tempt them in that direction. W.

[In the "make-up" of the paper it was found impossible to bring all the illustrations together, therefore the best arrangement under the circumstances was adopted, and it is hoped the page and plate references will be sufficient. — ED.]



THE treatment of the façade of the new Tremont Temple at Boston offers a grand chance for effective terra-cotta work. The openings at the balcony level, coming just above the stonework of the first two stories, are framed with most elaborate detail. There are three groups of triple arched windows, the archivolts coming down upon pilasters of the richest modelling. The archivolts themselves are simple, as shown by the accompanying photograph of the middle voussoir, and the terminal which crowns each of the nine arches. At the springing of the archivolts of the outside arches of each group a terminal ornament essentially half of the crowning one is inserted.

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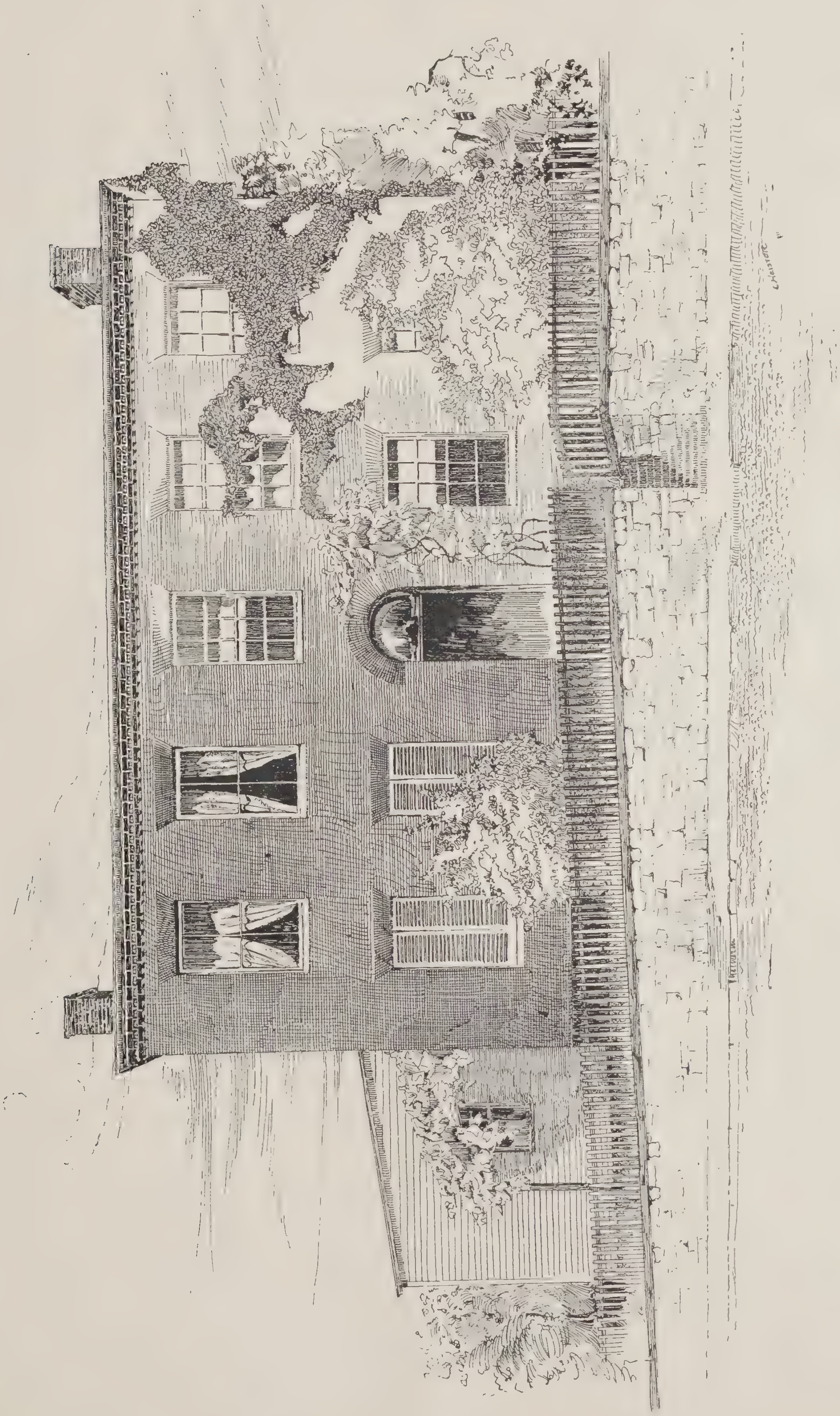
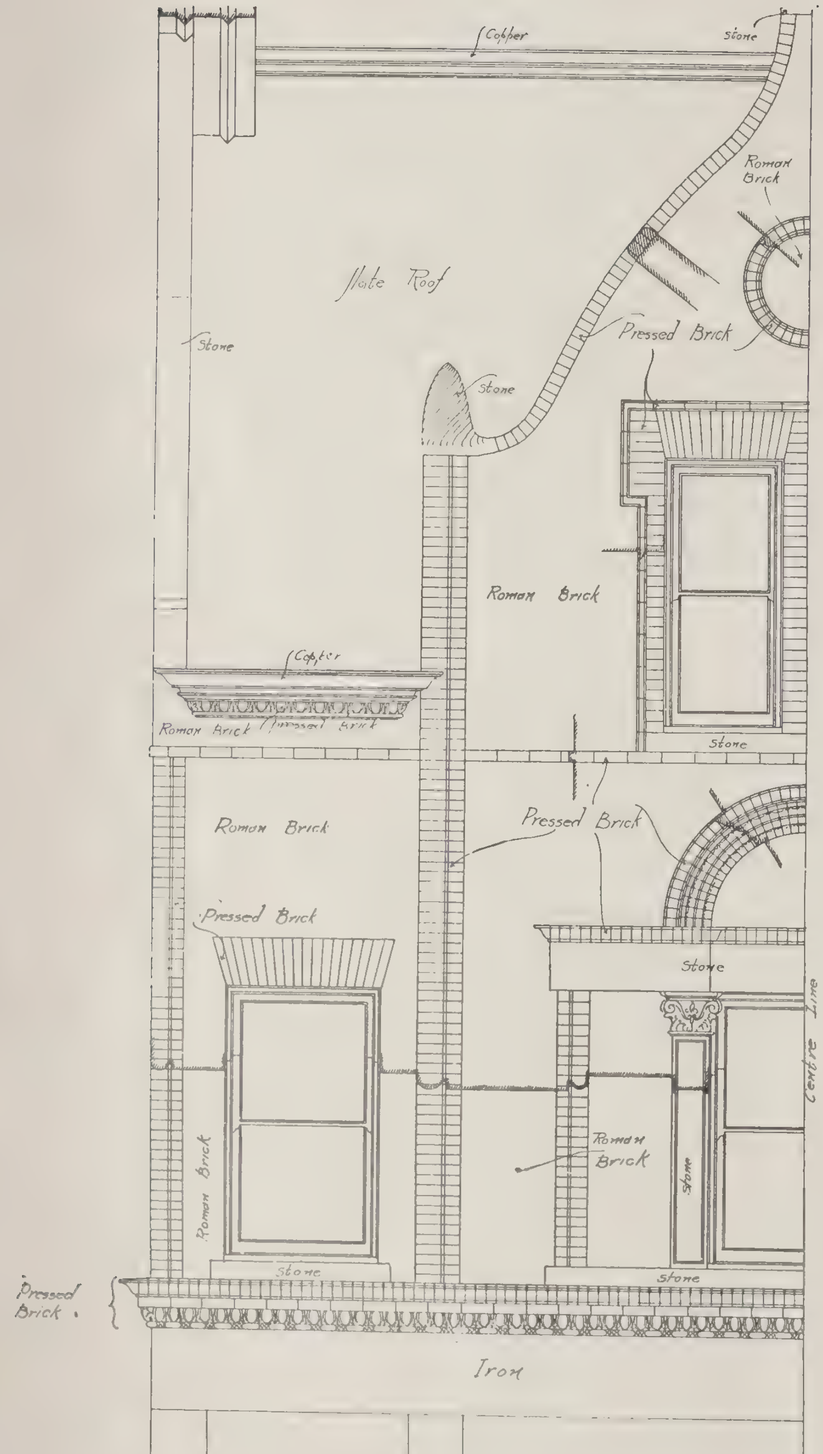
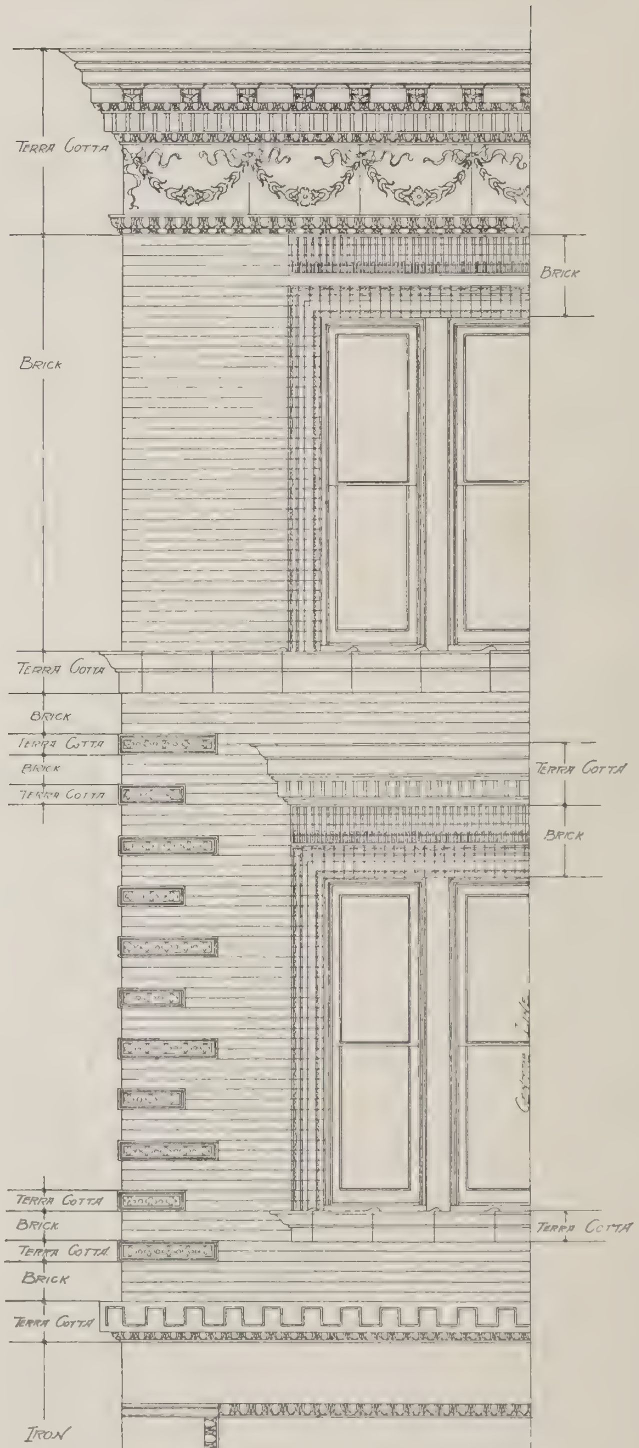


OLD WHITTAKER HOUSE, CINCINNATI. (See article, page 177.)

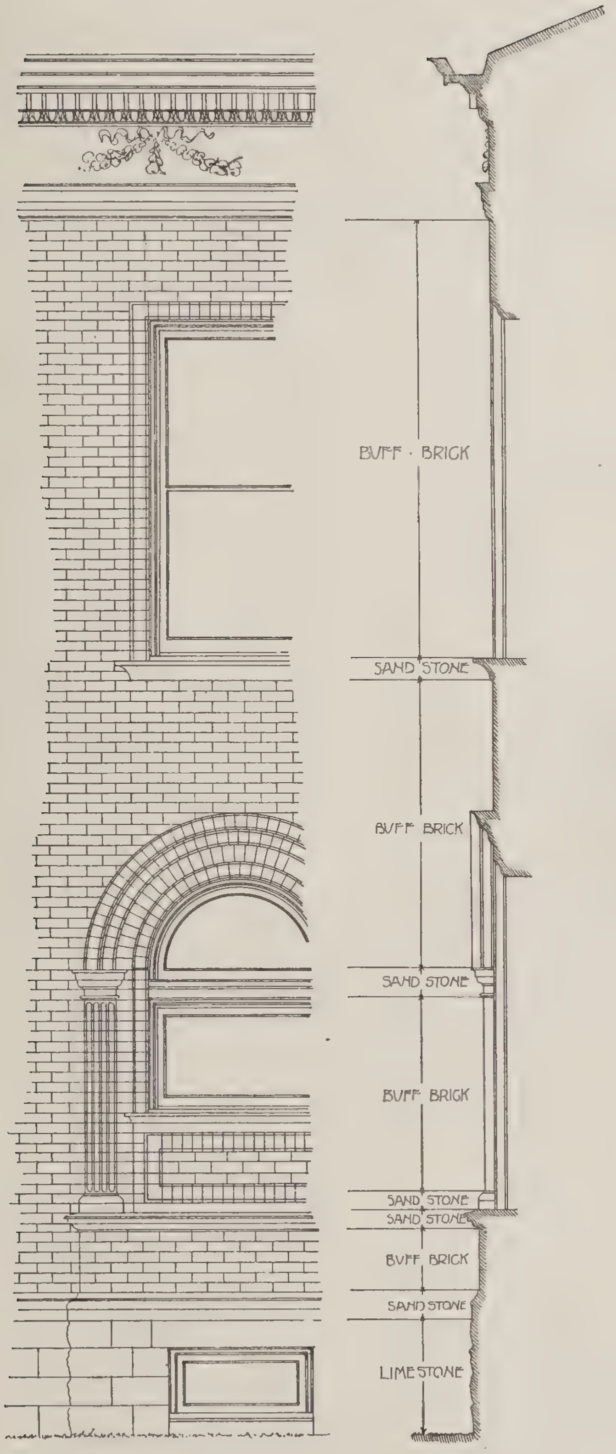


A. O. ELZNER, Architect. (See pages 179 and 182.)

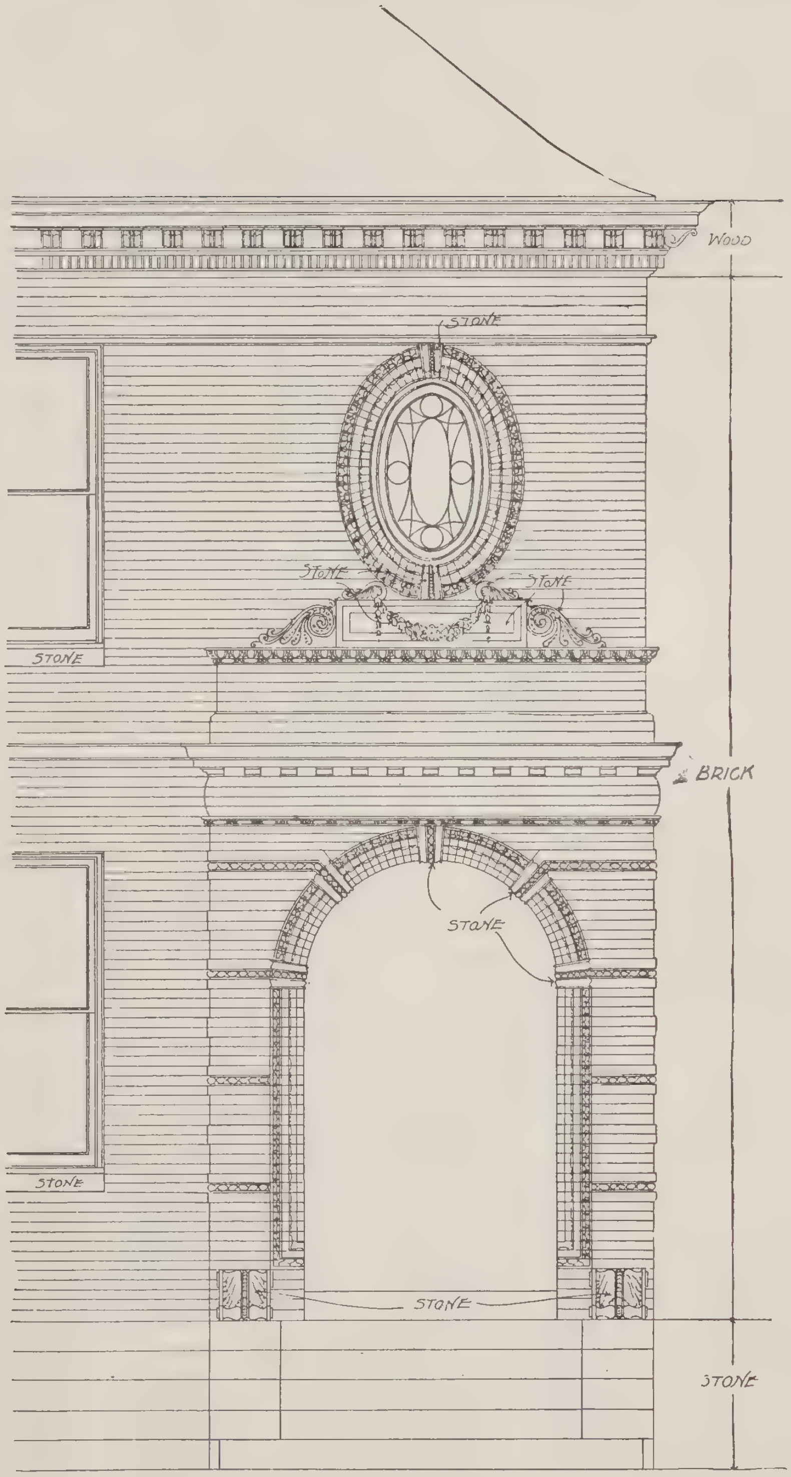


RIEG & MARTY, Architects. (See pages 177 and 179.)

PART ELEVATIONS AT QUARTER-INCH SCALE, STORES IN CINCINNATI, O. (See article, page 177.)

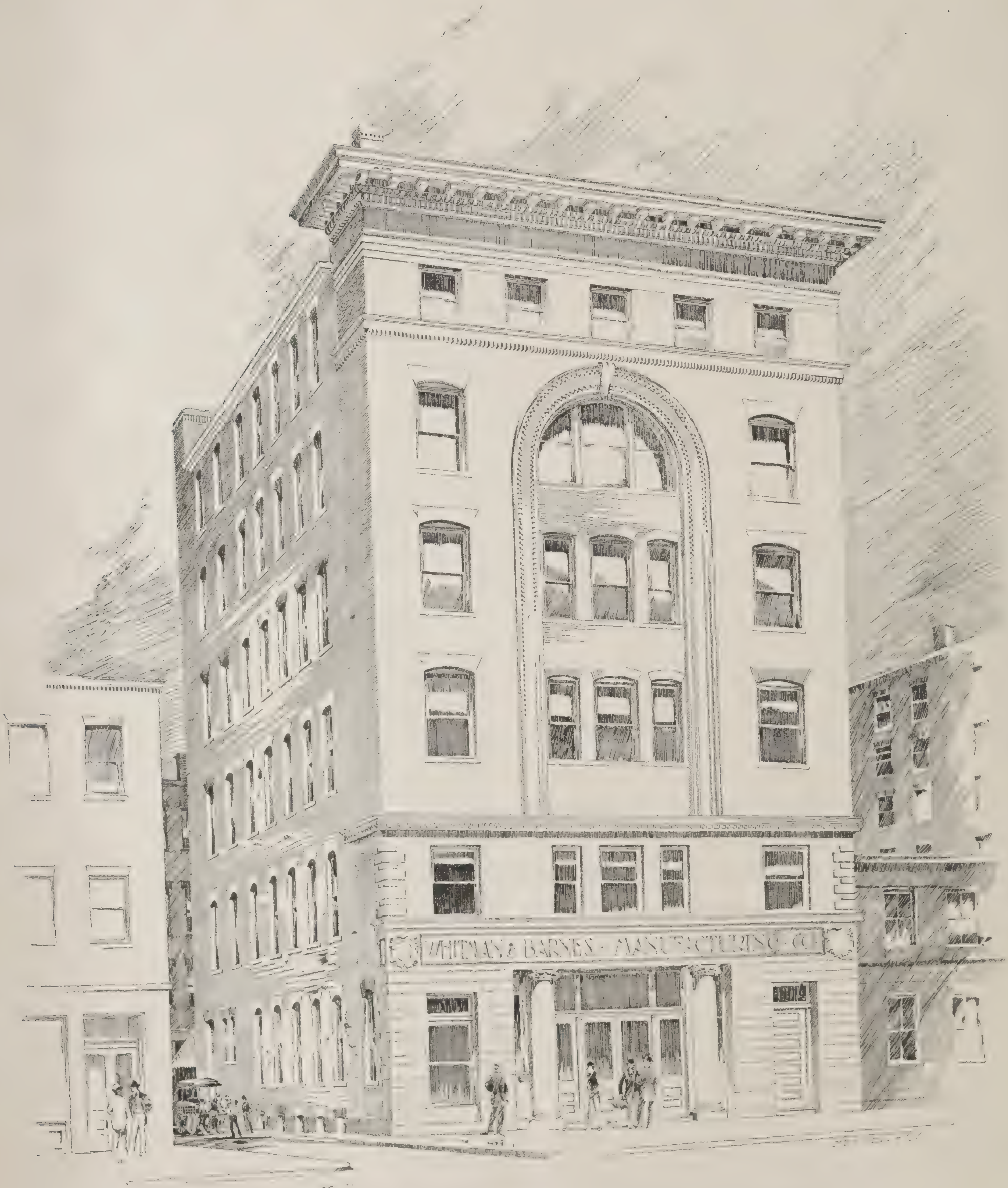


Des Jardins & Hayward, Architects. (See page 179.)



A. O. Elzner, Architect. (See pages 179 and 191.)

QUARTER-INCH DETAILS FROM CINCINNATI RESIDENCES. (See article on page 177.)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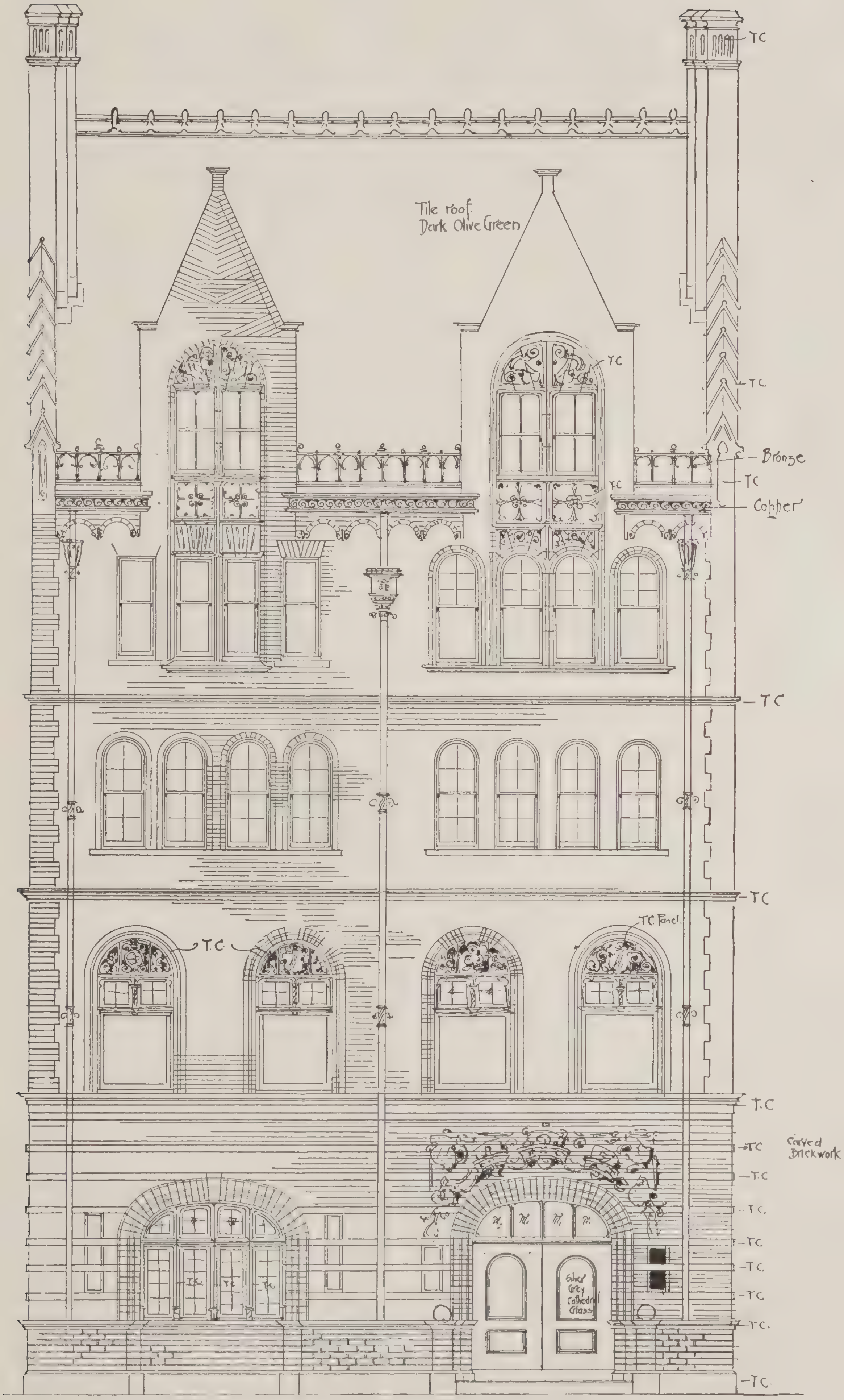
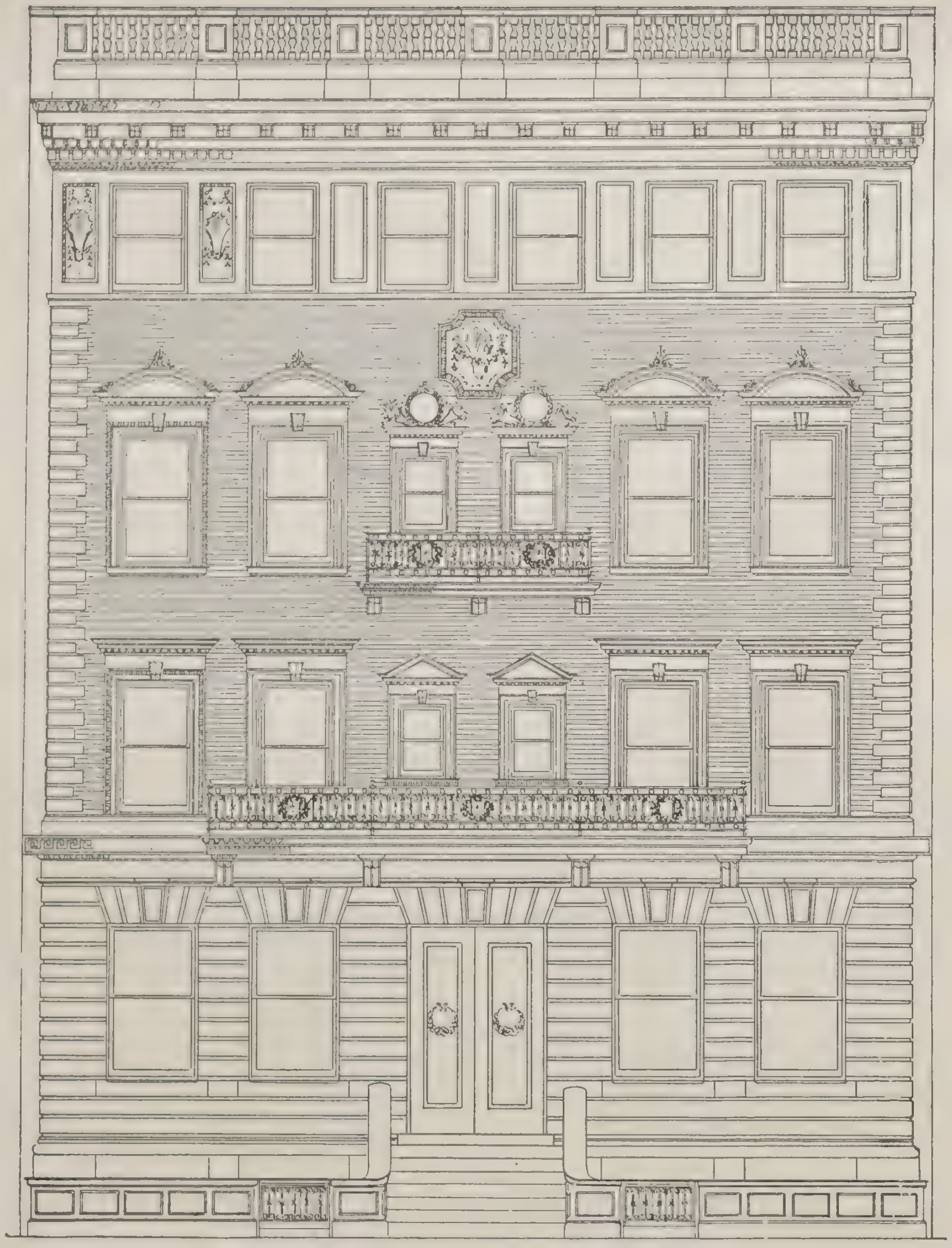
WHITMAN & BARNES BUILDING, CINCINNATI, O. A. O. ELZNER, Architect. (See article on page 177.)

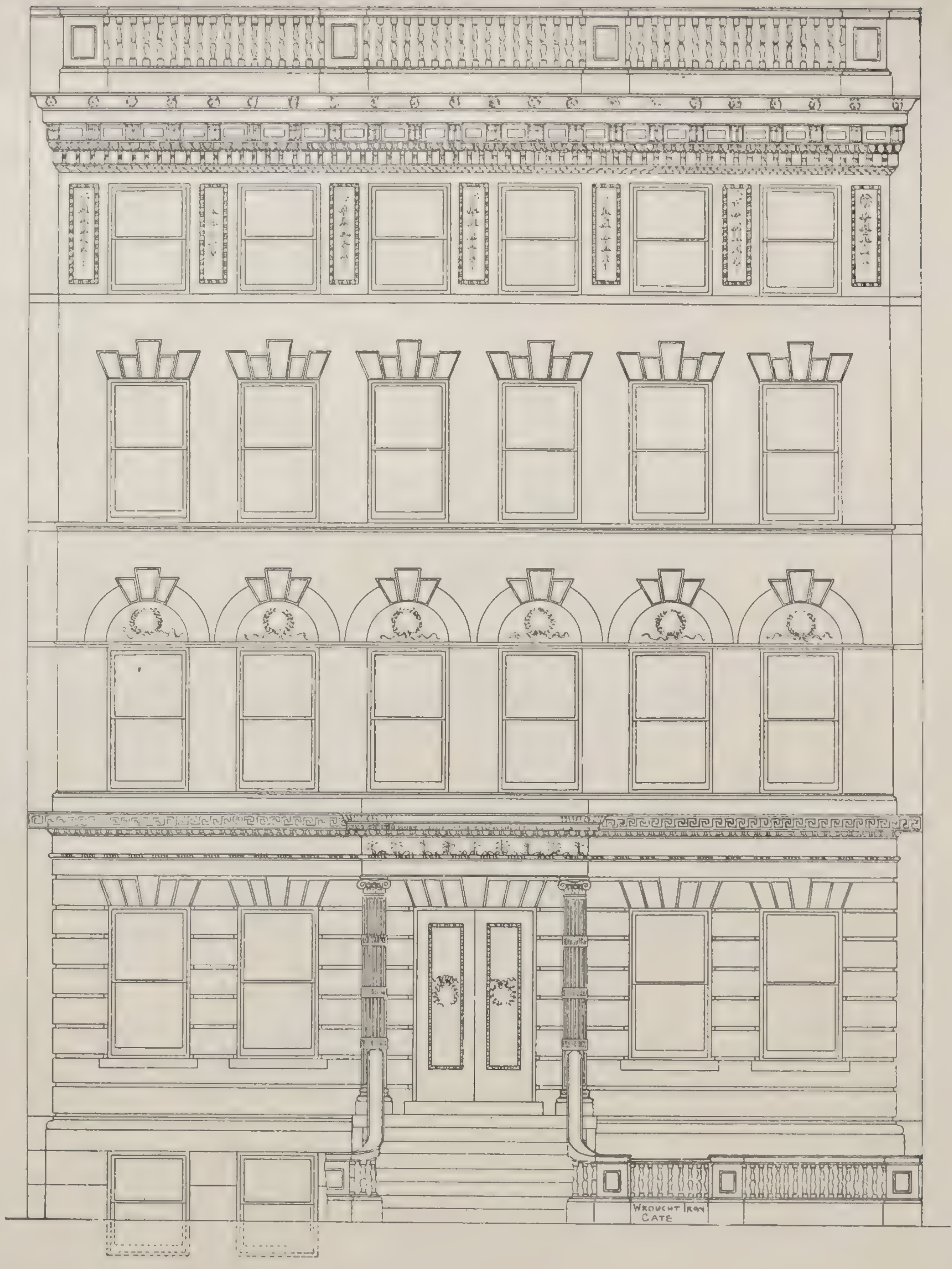


DESIGN SUBMITTED IN THE COMPETITION FOR A CITY HOUSE.

By GEORGE MORTIMER, Chicago.

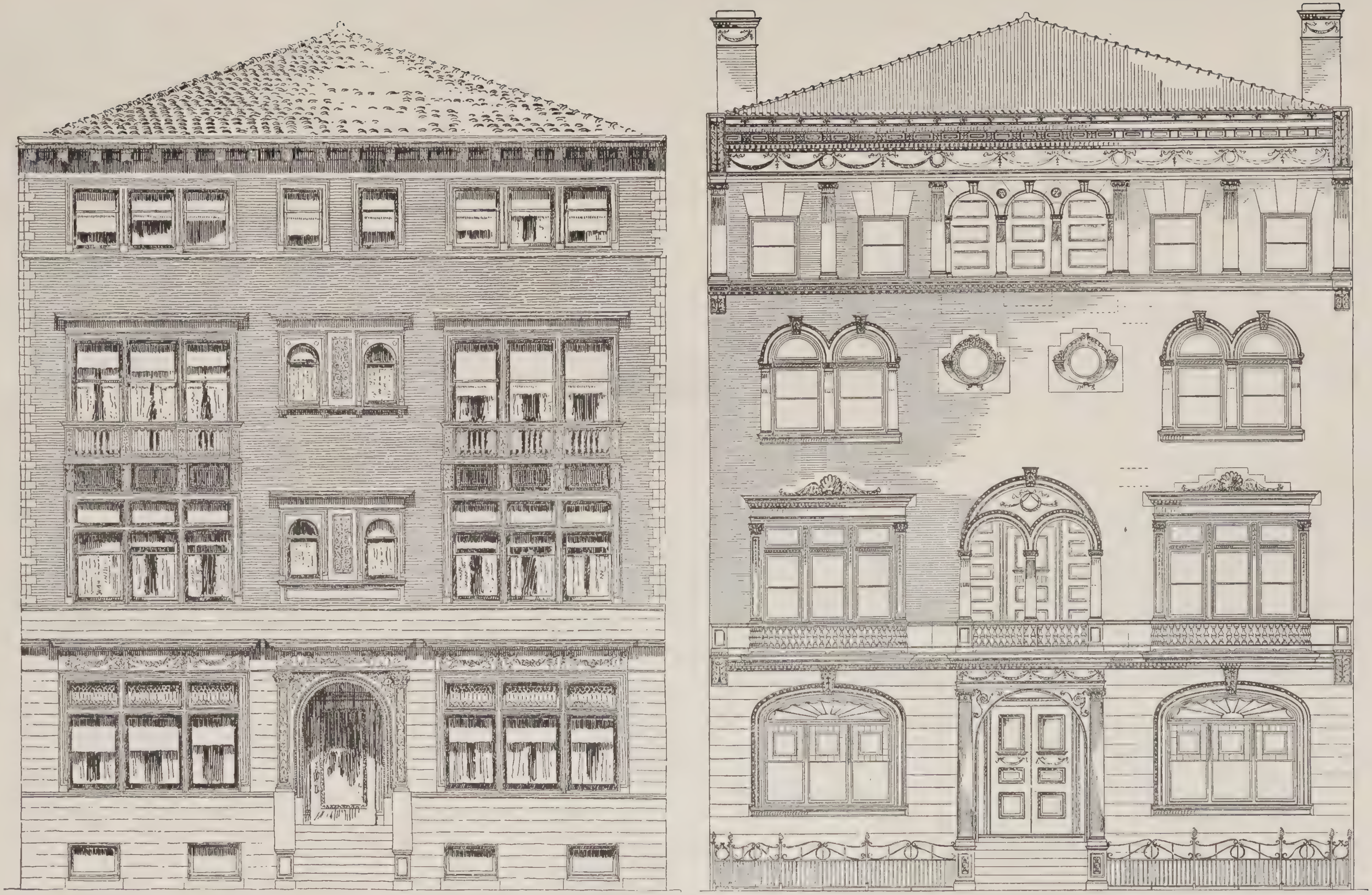


John Gluike, Rochester, N. Y.



John M. Dunn, Rochester, N. Y.

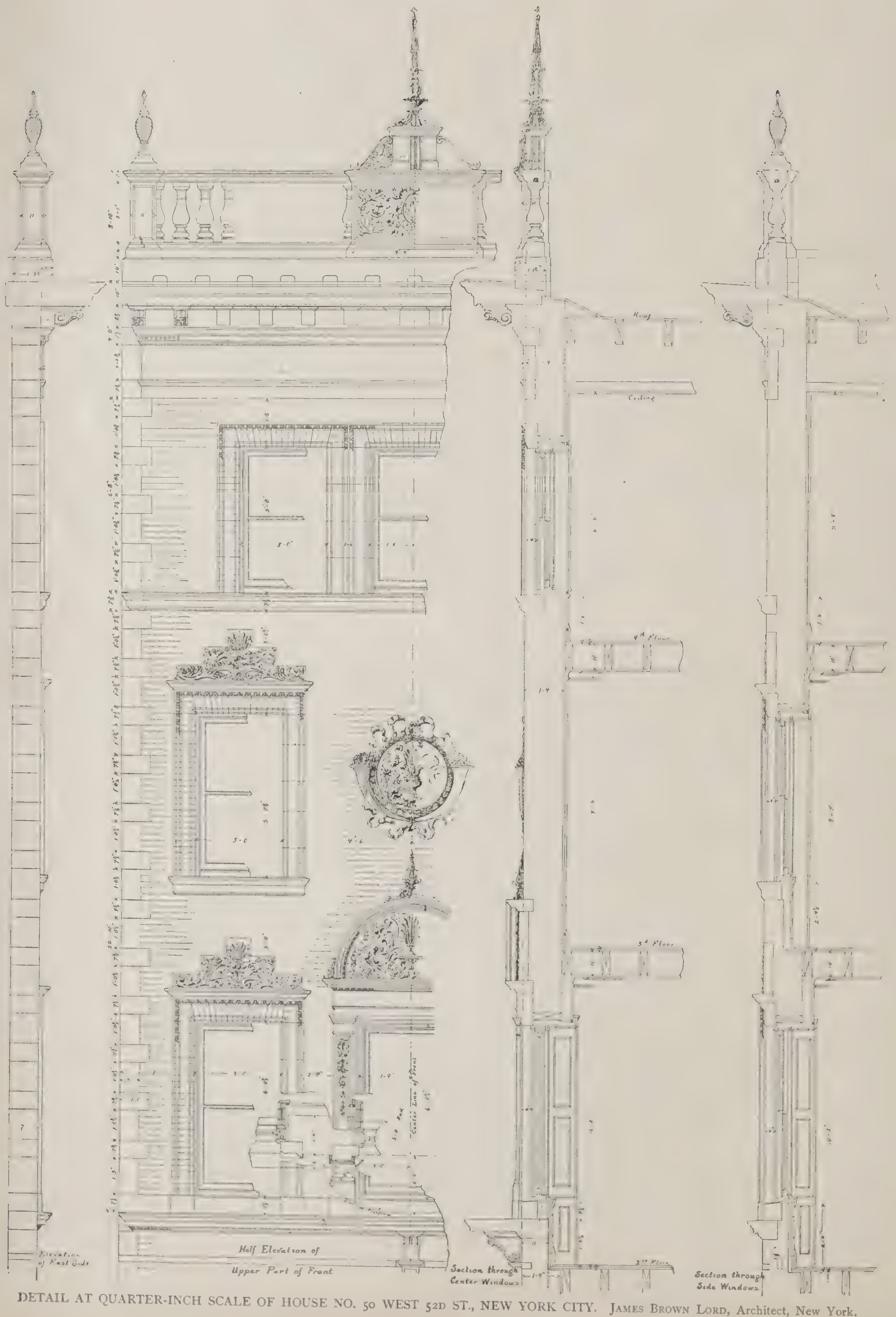
DESIGNS SUBMITTED IN THE COMPETITION FOR A CITY HOUSE.



Edward T. Wilder, Chicago.

Clarence R. Willard, Boston.

DESIGNS SUBMITTED IN THE COMPETITION FOR A CITY HOUSE.


Roof
Ceiling
4th Floor
3d Floor
3d Floor
Elevation of East Side
Half Elevation of Upper Part of Front
Section through Center Windows
Section through Side Windows
Center Line of Front

DETAIL AT QUARTER-INCH SCALE OF HOUSE NO. 50 WEST 52D ST., NEW YORK CITY. JAMES BROWN LORD, Architect, New York.

THE BRICKBUILDER.

AN ILLUSTRATED MONTHLY DEVOTED TO THE ADVANCEMENT OF ARCHITECTURE IN MATERIALS OF CLAY.

PUBLISHED BY

The Brickbuilder Publishing Company,

CUSHING BUILDING, 85 WATER STREET, BOSTON.

P. O. BOX, 3282.

Subscription price, mailed flat to subscribers in the United States and Canada	$2.50 per year
Single numbers	25 cents
To countries in the Postal Union	$3.00 per year

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Entered at the Boston, Mass., Post Office as Second Class Mail Matter, March 12, 1892.

THE BRICKBUILDER is for sale by all Newsdealers in the United States and Canada. Trade Supplied by the American News Co. and its branches.

PUBLISHERS' STATEMENT.

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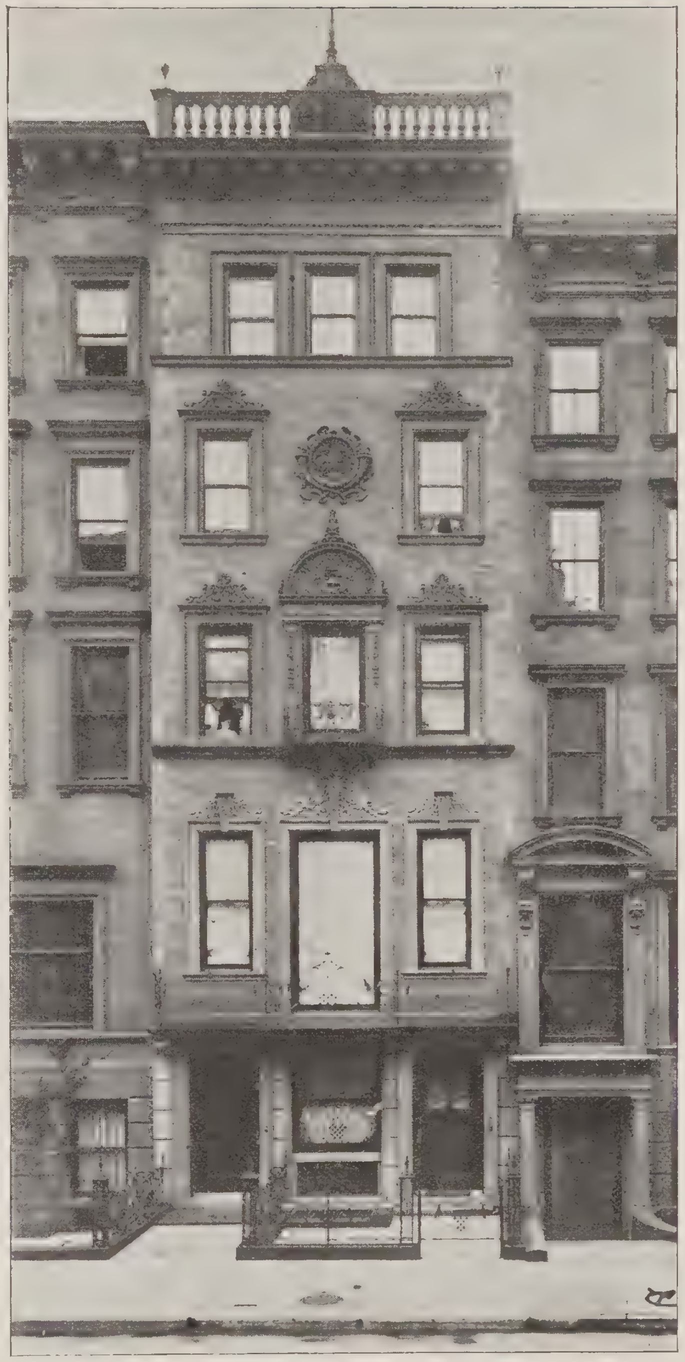
IN the use of mottled brick, ornamental work of small scale is almost always a failure, yet we constantly run across buildings in process of erection where this mistake is being made. For large work, as, for instance, a corbelled cornice, where there are broad and deep shadows, mottled brick are quite as effective as any other, but in small details, such as belt courses and arches, we have yet to see them effectively used. In designing such details, recourse must be had to the projection of parts producing shadows, which really form the design. The projection can never be enough to throw a broad shadow, or the work will become heavy and coarse, and therefore, to make a small shadow count, it must not have the competition of local color. The mottling constantly brings dark spots where they destroy the outlines of shadows, and as a natural consequence confuse the design, which depends upon the clear delineation of these shadows. In speckled brick the spots are so small as to make little difference, affecting only the general tone and texture of the brick; but when the broader effect of a mottled surface is desired, small ornament is better omitted. The value of mottled brick is almost entirely restricted to broad surfaces, which from their very size must be given some variety of color to relieve them from the smooth painted appearance which is so disagreeable.



RESIDENCE FOR J. W. HENNING, ESQ., NEW YORK.
JAMES BROWN LORD, Architect. (See opposite page.)

SIXTH ANNUAL COMPETITION
FOR THE
ROBERT CLARK TESTIMONIAL
UNDER THE AUSPICES OF
THE CHICAGO ARCHITECTURAL SKETCH CLUB
OF CHICAGO.

CONDITIONS.

The competition is open to architectural draughtsmen under thirty years of age, residents of the United States, and not practising architects.

The author of each design must execute all drawings without assistance, and non-adherence to these conditions will cause the rejection of the design or designs in question.

The awards will be made by the Adjudicating Committee on the "Robert Clark Testimonial" competition, and are: first prize, gold medal; second prize, silver medal; third prize, bronze medal.

Those designs receiving honorable mention will receive special bronze medals.

The prize drawings are to become the property of the Chicago Architectural Sketch Club.

PROGRAMME.

A design for the façade of an "Art Club" House in a Classic or Renaissance style, the building to be situated on a residence boulevard.

The building shall be eighty feet in width, situated on a lot one hundred feet in width, and at a distance of twenty-five feet from the inside line of the sidewalk. The lot is not situated on a corner, and little or no attention is to be paid to the sides of the building, beyond indicating the proper return of the cornice, etc., in the perspective.

The rooms which require expression, and which take their light from this front are: —

First Story. An entrance located in the centre and a single room on either side, to be used as reception and reading rooms.

Second Story. A large banquet hall located in the centre, and a small unimportant room on either side, which can be lighted from the front or from the sides at the discretion of the competitor.

Third Story. The third story is devoted to bedrooms, to be arranged at will.

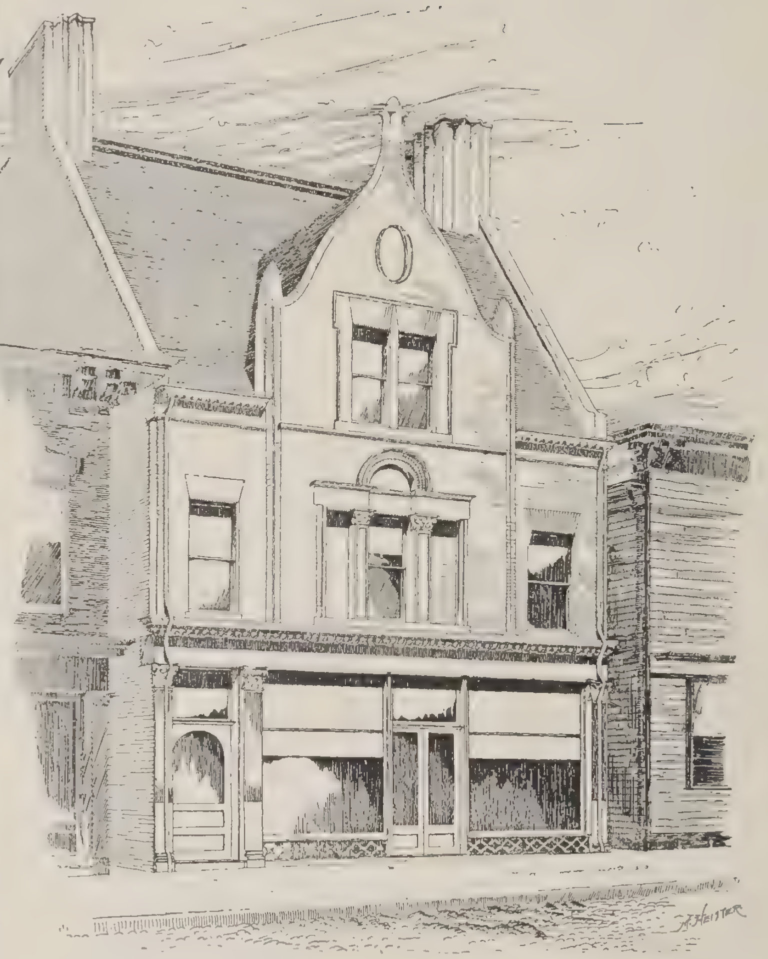
The drawings required are an elevation, at a scale of one fourth of an inch to a foot, rendered in line with pen and ink without shadows or other embellishments, and a perspective rendered at will. They are to be mounted upon stretchers or heavy cardboard 29 x 40 inches, and must be marked with a device or *nom de plume*. An envelope marked in a similar manner, and containing the name and full address of the author, with place and date of birth, must accompany each design.

Drawings must be delivered to John Robert Dillon, Secretary, Chicago Architectural Sketch Club, at the Club House, 274 Michigan Avenue, Chicago, on or before Thursday, Nov. 15, 1894, charges to be prepaid. All drawings not receiving prizes will be returned at the expense of the contributor.

The Adjudicating Committee on the "Robert Clark Testimonial": —

W. B. MUNDIE, *Chairman.*
FRANK L. WRIGHT.
IRVING K. POND.

ANY energetic draughtsman who is willing to thoroughly canvass his city or town for subscribers to THE BRICKBUILDER may have a commission that is worth his consideration. Architects, draughtsmen, builders, material dealers, and brick manufacturers are possible subscribers.



SUBURBAN STORE, CINCINNATI. A. O. ELZNER, Architect.
(See page 179.)

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FIREPROOFING CITY HOUSES.

MR. MANLY N. CUTTER, a well-known New York architect, has published in a recent issue of one of the New York architectural journals a very interesting description of a system of fireproof construction applied to an ordinary dwelling-house, which is so disposed that, in Mr. Cutter's judgment, the structure is practically fireproof while actually costing less than one per cent more than if built with the ordinary wooden inflammable construction. Although an ordinarily well-built house with wooden floor beams, hollow wooden walls, and hollow furrings practically very seldom catches fire or is injured by any conflagration unless the flues or the electric wires are wrongly disposed, and although judging by results the wooden floor and wall construction is actually not as bad as it sounds, there is, nevertheless, no question but that some form of reasonably fireproof construction would be far preferable if it fulfilled the same conditions of comfort and expense. Even if the cost of such fireproof construction did not exceed ten per cent more than the cost of a similar building erected with the ordinary construction, the greater sense of security resulting, as well as the diminished insurance premiums, would surely make it an object in the majority of cases to adopt the fireproof construction. Unfortunately the fire-insurance companies do very little to foster such attempts. Generally speaking, the saving in insurance rates affected by using a thoroughly first-class construction is far less than the interest on the added cost over that of a shoddy building. Or in other words, assuming that a building is to burn down sooner or later, it would pay an owner better to build poorly than to built well. Fortunately there are a great many property owners who are more far sighted than the insurance companies, and are glad to welcome a construction such as Mr. Cutter has devised.

Like nearly all new things, there is little that is unusual in this construction. It is rather the application that is new. For an ordinary city house eighteen feet wide, the front wall is built in the ordinary manner, that is to say, with brick or stone piers. The party walls are formed with columns consisting of single I beams placed twelve to fourteen feet apart, carried continuously from the foundations to the roof, and connected by girders at each floor level which support the steel floor beams. Between the columns a wall is formed with two layers of ordinary hollow terra-cotta partition blocks. Mr. Cutter introduces between the two blocks a wire netting fastened to the columns and girders, whose only function seems to be to stiffen the blocks. It seems as if this feature might be omitted entirely. For the rear walls, or rather for the walls of any extension in the rear of the house, a framework is built with angle irons faced with four inches of brick on the outside and filled in between with terra-cotta. As a piece of architecture, a four-inch brick wall of this description is entirely too flimsy. It would seem as if a better construction would be one which has been adopted under somewhat similar conditions elsewhere, to fill in between the framework with terra-cotta blocks, stretch on the outside of the framework wire netting or lathing of some description, and plaster the outside with cement plastering. This would be somewhat more expensive than the brickwork, but would surely be a great deal more durable. The floors are constructed by stretching from beam to beam a mesh of coarse wire netting which serves to hold a layer of concrete about four inches thick. This is practically the system known as the Manhattan fireproof construction, using concrete instead of a mixture of plaster of Paris and sawdust, the concrete being a doubtful improvement, besides increasing the weight. The ceilings are furred with metal lathing and plastered in the ordinary method, and of course all interior finish would correspond in general to that in a house built in the ordinary manner.

It will be seen that this is practically an application of what is known as the Chicago skeleton construction, and as all the framing is made with I beams, it can easily be bought out of the stock of any mill and put together at minimum cost. In fact, the figures which Mr. Cutter gives of the cost are really of more interest than the construction itself. These are as follows: —

THREE FOUR-STORY AMERICAN BASEMENT HOUSES
ON LOT 50 x 100.

COST OF ORDINARY NON-FIREPROOF CONSTRUCTION.

Floor and roof timbers	$1,743.00
Roof boarding	180.00
Rough floors	810.00
Furring	525.00
Studding	960.00
Grounds	375.00
Cornice, tinning, bay-window, galv. iron	1,557.00
Window frames, sash and glass	2,100.00
Excavation	600.00
Footing courses	277.00
Foundations, front area	45.00
Brickwork	7,260.16
Chimney caps	15 00
Plastering	1,500.00
Stone fronts	4,164.00
Bluestone coping	73.00
	$22,184.16

COST OF FIREPROOF CONSTRUCTION.

Iron work for walls	$2,721.00
Roof boarding	180.00
Rough floors	810.00
Floors and roofs	3.572.00
Chimneys	130.00
Terra-cotta and labor	2,304.79
Cornice, tinning, bay-window, galv. iron	1,557.00
Window frames, sash and glass	2,100.00
Excavation	600.00
Footing courses	277.00
Foundations, front area	45.00
Brickwork	3,178.99
Chimney caps	15.00
Plastering	1,091.38
Stone fronts	4,164.00
Bluestone coping	73.00
	$22,819.16

Total cost of three houses, with the exception of plumbing, wood finish, stairs, etc., all of which would cost the same in either method of construction. The fireproof construction costs, for three houses, $635.00 more than the non-fireproof construction, or $211.66 for each house.

But while no one can question the desirability of a system of construction such as is described, it certainly seems as if either the New York prices quoted were very high for masonry and timber work, or extremely low for iron and terra-cotta. The essential difference between this and the ordinary combustible construction is in the walls and the floors. If we adopt the current prices in Boston, a sixteen-inch brick wall with bricks laid in the wall at $16 per thousand would cost practically fifty cents per square foot of surface. On the other hand, with this fireproof construction we would have two courses of terra-cotta blocks which would cost, laid, thirty-two cents per foot. No sizes are given by Mr. Cutter for the iron work, but assuming that ten-inch twenty-five pound beams were used both for girders and for columns (and for a high building this would not be sufficient), the iron work would cost per square foot of wall surface for stories twelve feet high twelve cents per foot. The wire which is introduced between the rows of blocks would not cost less than two cents a foot, bringing the total cost for the terra-cotta, the iron and the wire to sixty-four cents per foot, in addition to which there would be a little extra for furring around the columns, etc., or in other words, judged by Boston prices, this construction would save only four cents a foot over the cost of a solid sixteen-inch wall, and would actually cost eight cents a foot more than a twelve-inch wall. If we consider the cost of the floors also, ten-inch iron beams five feet apart would represent a weight of five pounds per foot of floor surface, equal to fifteen cents. The filling of concrete work would cost at least twenty-five cents, and the suspended ceiling work would cost about three cents a foot, making a total cost of forty-three cents for the iron work, concrete, and furred ceiling. As against this we would have 2 x 12 hard pine floor beams, twelve inches apart, equal to two feet of lumber per square foot of floor, which at $20 per thousand would be four cents a foot. And it is accordingly difficult to see how the construction described above could anywhere near compete in price with the ordinary construction. It would seem more likely that in actual practice the fireproof construction would cost at least ten per cent more than the wood, even under the most favorable circumstances; and while having every confidence in preliminary estimates such as Mr. Cutter has made, it still must be acknowledged that the cost of a building is not what some one wishes it to be, but rather what some builder will actually execute it for.

But even under the most extreme circumstances, a construction such as Mr. Cutter indicates could certainly be put in at a reasonable price, considering the added security and the diminished insurance premiums; and it certainly is an attempt in the right direction, which ought to be encouraged and adopted wherever possible.

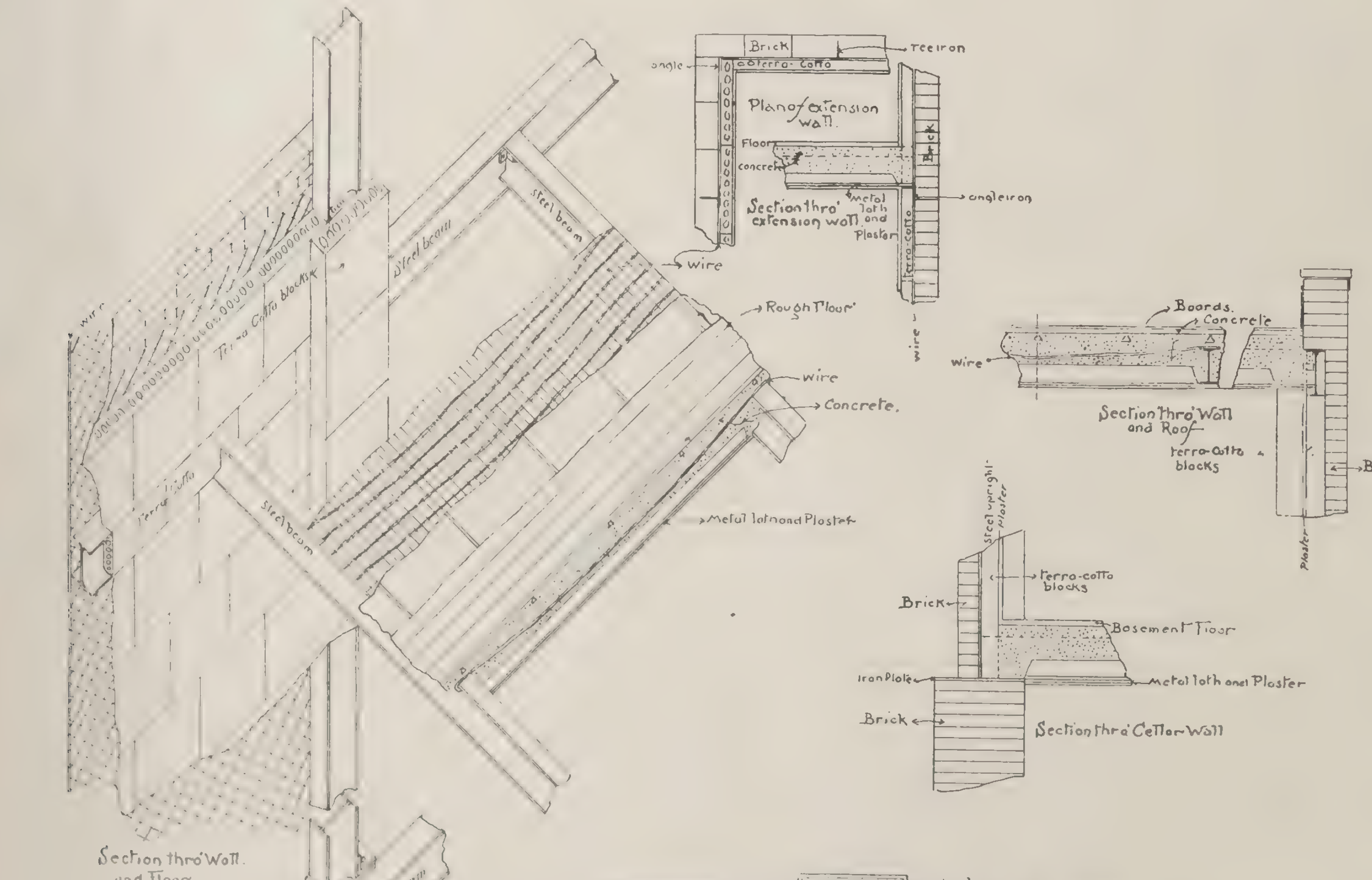
C. H. BLACKALL.

THE CRITICISM OF ARTICLES.

IN asking Mr. Blakckall to write the above article, we hoped to get an expression of opinion which might lead to some discussion of this idea in fireproofing. If any of our readers have anything to say, one way or another, let us hear from them. There are several statements which seem to invite discussion, and we are always ready to give space to criticisms made in the friendly and courteous manner that characterizes Mr. Blackall's writing.

A TEST OF FIREPROOFING.

IT is seldom that a manufacturer is so lucky as to have at his office door a satisfactory test of his materials, but the Raritan Hollow and Porous Brick Co. have had this, and in our next issue we will publish three photographs, showing the effect of a fire in the office building at 874 Broadway, New York, on the same floor with, and almost next door to, the Raritan offices. This building was built with their fireproofing materials. The fire was a hot one, but the fireproofing stood it. With the photographs full details will be given.



Fireproof construction for a city dwelling
Manly N. Cutter. Archt
203 Brdway New York. City

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A REVIEW OF VARIOUS METHODS OF CONCRETE CONSTRUCTION AS APPLIED IN ENGINEERING WORKS.

CONCRETE FOOT PAVEMENTS. COMPLETE SPECIFICATION, AS PRESCRIBED IN THE BEST PRACTICE THROUGHOUT THE UNITED STATES.

THE introduction of concrete for foot pavements, sidewalks, and curbs in New England is a matter which yearly becomes more important as the use of this material becomes more general.

The New England States are the last to adopt concrete as a paving material, and consequently they should be in a position to avoid the errors that have proved expensive, if not disastrous, elsewhere.

It is difficult to conceive of a more splendid material for pavement work than concrete, if it is properly handled; and, on the other hand, nothing is more objectionable than a poor, brown, broken cement walk. A flag walk may be broken and uneven, a brick one may be full of hollows and humps, a granite one may be as slippery as ice, but they will all be passed over without comment, while a cement walk, even if smooth and in good repair, will come in for criticism and remark whenever a small crack appears.

There are many cities in the Union in which no other pavement is allowed, and it is needless to say that those cities commend themselves at once to the stranger by reason of their excellent pavements, which give an air of refinement, tidiness, and public spirit that can only be equalled by magnificent roads and streets. There is no city of importance in the West in which concrete is not extensively, not to say exclusively used for pavements, both in the business sections and in the suburbs. The specicification is regulated by the authorities, and deputies and inspectors are appointed whose sole duty it is to see that these pavements are properly constructed.

It is the custom in many cities in the business sections to excavate the cellars out to the curb line, and then to build a concrete arch pavement on I beams or other bearers, with a finished wearing surface, from the building to the street. No brick arch is necessary, as the concrete will do its work as well alone. It is found that the concrete curbs, while being inexpensive, will wear as long as granite, and the beauty of the continuous pavement, carefully trowelled and jointed, is not to be equalled in any other paving material whatsoever.

For suburban work the most pleasing effect is secured by a pavement four or five feet wide, laid with three feet of grass on either side, — with concrete curbs, steps, and bulkheads. When handled skilfully no material will give such satisfaction from an artistic standpoint as well as from one of utility.

The whole success of concrete lies in the manner in which it is used, the materials, the workmanship, the method of draining, and the skill and care used in carrying on the work.

The methods of cheapening concrete are legion, and where competition is sharp, there is much temptation to adopt this or that expedient in order to lower the cost. It is as a protest against cheap work that the writer has drawn up the following specification. It is certainly true that, unless the details mentioned below are carefully heeded, there will be more or less serious results. Concrete will withstand any climate, as any one may find who will take the trouble. Some of the finest pavements in the country are in Minneapolis, others are in St. Augustine. Concrete is used exclusively for sidewalks in San Francisco, it is supplanting everything else in New York, but unfortunately some very poor work is being done there, with the inevitable results.

If a pavement breaks or cracks or scales off it is the fault of the party who constructed it. It is a simple matter to lay walks here in Boston which will not only endure for years without cracking, but will resist the heaviest traffic and the roughest usage.

The most important matter in this pavement work is the foundation; for unless this is properly constructed, let the pavement be made of the finest of materials and in the best fashion, it is bound to crack. A good foundation, proper materials, and skilled workmanship are essential for the construction of first-class pavements, and it is the writer's hope that a proper appreciation of these facts will develop in New England and create a demand for the best work.

SPECIFICATION.

Foundations. Wherever the pavement is to be placed on the ground, excavate at least 19 inches, carrying the excavation about 4 inches out beyond edges of finished walk. If possible, lay blind drains to gutter or catch-basins.

Fill the excavation 15 inches with hard burned cinders, clinker, or ashes, or with large clean stone or broken brick or pottery. Tamp down to a solid bed and bring surface to proper level and grade. It is important that the foundation be solid and also that it be porous, so as to allow the water to flow away from beneath the pavement readily, otherwise in winter the walk will surely be heaved out of place and broken.

Materials. Use imported Portland cement exclusively, of standard quality and of one grade, German preferred. On no account use one cement for the bottom and another for the top, as, for instance, Rosendale and Portland, or even two different brands of Portland cement on the same piece of work. For in order to secure a perfect bond and adhesion between the top and bottom layers, the two must set in the same time and manner. A quick-setting concrete used in the bottom cannot be made to adhere to a slow-setting concrete used in the top, and unless this adhesion is perfect the walk is very liable to break up. For aggregates use any of the following materials, which are named in the order of their merit, viz.,

NEW YORK AND ROSENDALE CEMENT COMPANY
ROSENDALE HYDRAULIC CEMENT.
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granite, basalt, flint, hard limestone, hard clinker brick or pottery, slag free from sulphates, or good gravel. In all cases the aggregate should be clean and free from dirt or clay. All aggregate for the bottom layer should pass through a two-inch ring, and if clean it is generally preferable to use it all just as it comes from the crusher, a gritty, fine material being often better than sand. In this bottom layer it is better to have too little fine aggregate rather than too much. For the top use granulated stone, ranging in size from duck shot to the size of small beans, and having it entirely free from smaller sand and dust.

Mixtures. For the bottom use one part Portland cement to seven or eight parts of aggregate, dependent upon their quality, or if mill mixed, use nine or ten parts of aggregate. If mixed by hand, turn the materials over together twice dry, then add sufficient water to bring the concrete, after a thorough manipulation, into a very stiff viscous condition. For the top use one part Portland cement to two parts of aggregates of first-quality crushed stone. Mix into a stiff viscous mass, taking care not to get it too soft. The practice of putting on a wet top, and then using dry cement to absorb excess water, is a method of cheapening that should be condemned. It is better to put this top on in two or more layers, rubbing them down hard, and following layer upon layer immediately. Great care should be taken not to allow the concrete of the bottom to become set before the top is applied, otherwise the two will not adhere perfectly, and after a time the walk will sound hollow and break up.

Laying. As soon as thoroughly mixed put the bottom in place and tamp or roll down thoroughly. The thickness should be three and one half inches, no more is necessary. Then immediately spread on the top and trowel down hard, to a perfectly smooth and even surface.

The practice of putting chain, rods, etc., into the concrete is a good one, provided the iron is put in the proper places to take up the strains. If put midway between the upper and lower surfaces, it is perfectly useless, as far as imparting a tensile strength to the concrete is concerned.

Where the foundations are inadequate, it will be found advantageous to use iron in some form, but care should be taken to have it laid as close to the top and bottom surfaces as possible and run both ways of the block. This will protect the block from breaking, in case the frost should heave it.

Jointing and Marking. No block should be over seven feet square, the smaller the block the better. The blocks should be separated from one another by pieces of tarred paper or by a jointing tool which will prevent adhesion of the blocks. Care should be taken to make the joints true with the curb line and at equal intervals. Superficial or marked joints made with a tool having a one eighth inch blade are often advantageous.

Coloring. In order to secure a white walk it is necessary to use a very light steel gray cement, free from any brownish tinge, and the surface should be thoroughly trowelled, so as to bring the pure cement to the surface. Care must be taken in doing this, or minute expansion cracks will appear and mar the surface. For coloring blue or slate color use Dyckerhoff black or high-grade lampblack, and for reds use Prince's metallic paint or other mineral reds. Care must be taken in the selection of coloring matter, for much of it is not only useless, but will destroy the cement. In one instance that the writer has in mind a walk colored a deep red, came out in a few days a beautiful blue, much to the contractor's chagrin when he took a friend to see his fine red concrete.

Protection. As soon as work is finished it should be covered

DYCKERHOFF PORTLAND CEMENT

Is superior to any other Portland Cement made. It is very finely ground, always uniform and reliable, and of such extraordinary strength, that it will permit the addition of 25 per cent more sand, etc., than other well-known Portland Cements, and produce the most durable work. It is unalterable in volume and not liable to crack.

8,000 barrels have been used in the foundations of the Bartholdi Statue of Liberty, and it has also been used in the construction of the Washington Monument at Washington.

Pamphlet with directions for its employment, testimonials and tests, sent on application.

HAM & CARTER,
560 Albany Street, BOSTON.

E. THIELE,
78 William Street, NEW YORK,
Sole Agent United States.

ABERTHAW CONSTRUCTION COMPANY (Incorporated),

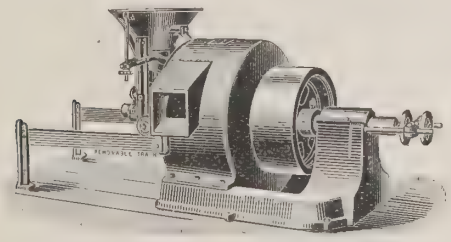
CONCRETE ENGINEERS

FIREPROOF FLOORS (Ransome System).

For Public Buildings, Hospitals, Schoolhouses, Office Buildings, Warehouses, Breweries, Stables, and Dwellings.
Contracts taken for all work in Portland Cement Concrete.

Foundations, Bridge Piers, Engine Beds, Retaining Walls, Pavements, Self-supporting Sidewalks and Sidewalk Lights (Ransome Patents).
Best Materials and Highest Skilled Workmanship.

12 PEARL STREET, BOSTON.



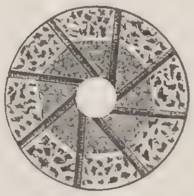
Sturtevant Rock Emery Mills

- - AND PATENT - -

TRADE

ROCK EMERY MILLSTONES.

MARK.



FIT ANY MILL FRAME.

Fastest fine grinder known.
Sturtevant Patent Vertical Mill has no rival for reducing ***Plaster, Paints, Chemicals, Carbons, Talc, Soapstone, Slate, Barytes*** and like materials. 30″ Mill Costing but $400, grinds to fine powder from 1 to 4 tons per hour. No foundations, no screens, no noise, no dust. Remember that for $400 you have a machine that is ***ready to run*** and that will keep running longer without repairs than any other fine grinder. Send for special circular.

Made of Blocks of Rock Emery set in Metal, making the hardest and most cutting millstone ever built, and not expensive.

A Customer Writes:

Sellersburg, Ind., June 25, 1894.

We can grind from 70 to 75 bbls. Louisville Cement per hour with your Rock Emery Stones. This is from 10 to 15 bbls. more per hour than our ordinary stones will grind. Since May 3 have dressed these but twice. Ordinary Stones we dress every three days. Rock Emery Stones save us several dollars per week in dressing alone.

CLARK COUNTY C. CO.

RAPID — because Rock Emery has no equal for cutting qualities. ECONOMICAL — because Rock Emery is the most durable grinding surface known. NO EXPERIMENT — because many large manufacturers in your own line already use and indorse them, and hundreds in use for other purposes.

SEND FOR CIRCULARS AND REFERENCES.

STURTEVANT MILL COMPANY, 70 KILBY ST., BOSTON.

with boards or clean sand and prevented from hardening too quickly, and the walk should be carefully wet twice a day for a week or ten days and allowed to harden as slowly as possible.

Curbs. Curbs are formed of concrete in the same way. The surface of the curbs should be formed one inch thick of "top" material and filled in behind with coarse concrete. The finishing should be done in the same manner as prescribed for pavements.

It will be found that these concrete curbs, while being cheaper than granite, will endure quite as long, and be equally as serviceable even for the heaviest traffic.

Ross F. Tucker.

AMERICAN PORTLAND CEMENT.

A CRITICISM OF MR. TUCKER'S LAST ARTICLE.

Sandusky, O., Sept. 6, 1894.

Editor Brickbuilder:

Sir, — I have read with great interest the paper on cements by Ross F. Tucker, Esq., lately published in your valuable periodical. The criticism of American cements with which the article closes is, however, it seems to me, unfair to American manufacturers, and calculated to delay the progress of the industry in this country. Having for several years collected statistics of the cement industry for the annual volumes of "Mineral Resources of the United States," published by the United States Geological Survey, the writer has had especially good opportunities for becoming acquainted with the condition of the industry in the United States. There are at present nineteen factories in this country producing true Portland cement by processes identical with those followed in Europe, with the exception of slight variations necessitated by the higher cost of labor in this country. The total American product during the past year amounted to over one half million barrels, or nearly one fifth of the quantity imported from Europe. It is doubtless true that in the past a considerable amount of American cement of inferior quality has been put on the market; but any one who is familiar with the process of manufacturing Portland cement, and knows what minute precautions must be observed to obtain a first-rate product, will hardly be surprised that a considerable amount of experience had to be gained before cement of a quality equal to that produced by the old factories in Europe could be obtained. Having for several years given close attention to the testing of cements, the writer can state with confidence that there are several factories in this country producing cement at least equal in tensile strength and soundness to any of the cements imported from Europe. Any one who has looked into the matter practically will agree that very much of the foreign cement which comes into our market is of *inferior* quality, and fails to show the results officially required by the Prussian minister of public works. It is evident that the best of the German cement is not generally sent to this country, since correct methods of testing are here so little practised, and cement which bears a foreign label is accepted without question by most architects and engineers. The prejudice in favor of foreign cement would disappear rapidly if users were provided with facilities for making careful tests. At present the American manufacturer is obliged to furnish a product equal in practical use to the best foreign cement, and to sell the same at from fifty cents to one dollar per barrel less than the price paid for cements of European manufacture. What is now needed to secure recognition of the quality of American cement is simply a sufficient number of careful and unprejudiced comparative tests. Until cements are bought on their merits, and not for the sake of the labels they carry, American cements will not bear the reputation they deserve.

Very truly yours,
S. B. Newberry,
Manager Sandusky Portland Cement Company.

Mannheimer Portland Cement.

UNEXCELLED IN QUALITY.

"The results of tests with standard quartz are far above the average of most cements."
CLIFFORD RICHARDSON,
Inspector of Asphalt and Cements,
Engineer Dept., Washington, D. C.

"This brand of Portland Cement was found especially qualified for the purpose of concrete casting on account of its perfect uniformity, intensive fineness, progressive induration after the first setting, and of its great tensile and crushing strength."
Vide Report of CARL A. TRIK,
Superintendent of Bridges, Philadelphia,
On Concrete Arch Highway Bridge over Pennypack Creek.

MORRIS EBERT,

IMPORTER AND SOLE AGENT FOR UNITED STATES, CANADA AND CUBA

NEW YORK OFFICE,
Postal Telegraph Building, 253 Broadway.

GENERAL OFFICE,
302 Walnut Street, PHILADELPHIA.

THE ALPHA PORTLAND CEMENT.

Its superiority is fully established; for fineness, uniformity of color, and great tensile strength it is unexcelled. Every barrel of "ALPHA PORTLAND CEMENT" guaranteed equal to the very best brands of "German Portland Cements," and its minimum tensile strength guaranteed as follows:

GUARANTEE.

1 day in air, 6 days in water, - - - - - 400 lbs. } Neat test Per square inch.
1 " " " 27 " " " - - - - - 500 "
1 " " " 3 months in water, - - - - 600 "
3 parts of sand to 1 of cement. — Adhesive test.
1 day in air, 6 days in water, - - - - - 125 lbs. } Per square inch.
1 " " " 27 " " " - - - - - 175 "

FINENESS.

Residue on sieve No. 50, - - - - - - - - - - None.
" " " " 100, - - - - - - - - - 10 per cent.
Passing through sieve No. 200, - - - - - - - - - 65 " "

Every barrel guaranteed to stand the boiling test, the test for safety.

Sole New England Agents, JAMES A. DAVIS & CO., No. 92 State St., Boston.

Gen'l Agents, WM. J. DONALDSON & CO., Betz Bldg., Phila.

ESTABLISHED 1858. **WILLIAM N. BEACH, President.**

LAWRENCEVILLE CEMENT CO.,

MANUFACTURERS OF

BEACH'S ROSENDALE HYDRAULIC CEMENT.

Guaranteed to stand all required tests. **115 Broadway, NEW YORK.**

GOOD MORTARS.

(Continued from last number.)

Cement Mortar. Generally speaking, the hydraulic cements require mixing with sand, but Portland cement may be used without sand. It sets with a comparative slowness, so that a good quantity may be mixed at once and used, without the inconvenience of immediate or very quick hardening, and does not reach its greatest strength until years after it has been used. Iron, bricks, or stone must be subjected to indurating solutions for their preservation. No preparation is required, on the other hand, for Portland cement. In the air, in the water, and in fact under all circumstances, the possibility of using this material with success forms one of the greatest recommendations in its favor.

On account of the great demand for Portland cement, a great many manufacturers have been induced to bring out an artificial kind, and this is used nearly as much as the genuine; and on account of its being able to stand a much larger dose of sand than the common cements, it is considered by some builders to be cheaper for that reason, and is admirably adapted for the following purposes: Concrete for foundation walls, wharfs and piers, sidewalks, garden and any outside walks; cellar, stable, brewery, and malthouse floors, any floor for heavy traffic, mastic stucco or outside plastering, for laying tile and marble floors, roofs, kitchen hearths, abutment of bridges, etc.

Keen's Cement. When used for walls, the coarse should be used with equal parts of sand for scratch coat, and then finished with superfine. This cement should only be used on inside work, which requires a smooth finish.

Metallic cement has a metallic lustre, is suitable for outside work, and is intended to dispense with coloring or painting, but is not much used. One variety is made by mixing ground slag from copper-smelting works with ordinary cement stone.

Rosendale cement is the most used of all brands, and for ordinary work gives good satisfaction. It should be mixed with twice its measure of sand for common work, and in heavy work care should be taken to use plenty of water and keep the bricks well wet.

Concrete is admirably adapted to a variety of most important purposes, and is daily growing into more extensive use and application. For foundations in damp and yielding soils, and for subterranean and submarine masonry, almost under every combination of circumstances likely to occur in practice, it is superior to brickwork in strength, durability, and economy, and in some exceptional cases is considered a reliable substitute for the best stone, while it is almost preferable to the poorer qualities.

For submarine masonry, concrete possesses the advantage that it may be laid without exhausting the water (which under the most

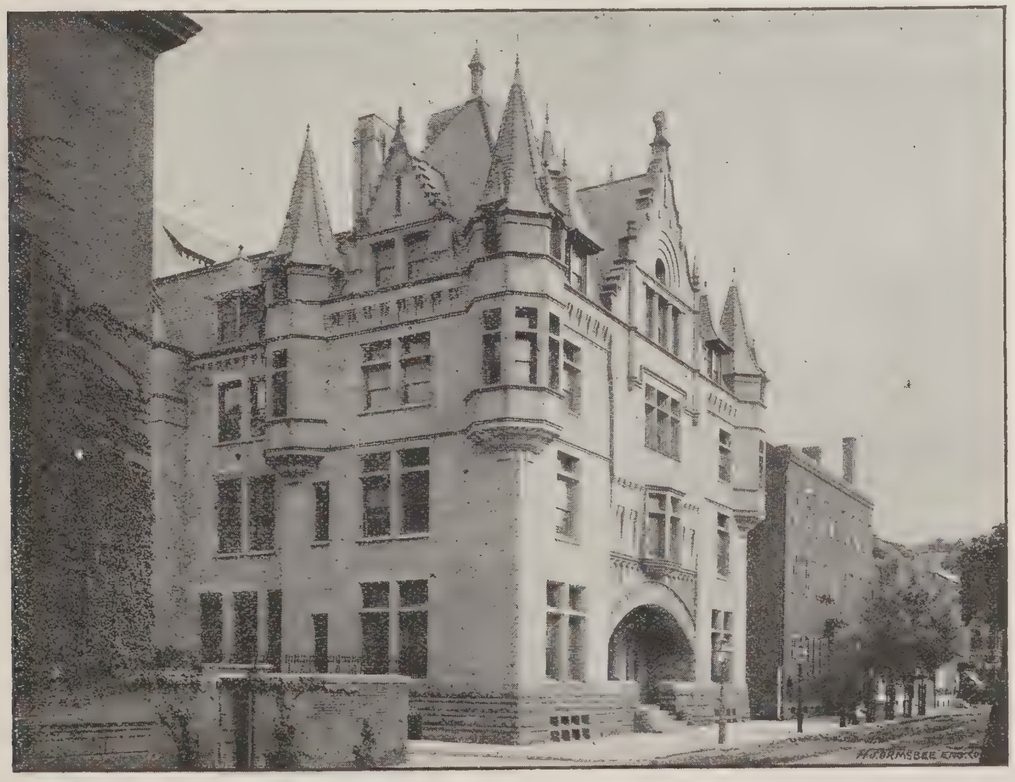
ATLAS PORTLAND CEMENT.

WARRANTED EQUAL TO ANY AND SUPERIOR TO MOST OF THE FOREIGN BRANDS.

OFFICIAL TESTS, Nos. 3567 and 3568, made by the DEPARTMENT OF DOCKS, New York, March 31, 1894, being part of contract No. 464 for 8,000 barrels.
TENSILE STRENGTH, 7 days, neat cement . . . . 622 lbs.
" " 7 days, 2 parts sand to 1 of cement . . . . 332 lbs.
Parts steamed and boiled . . . . Satisfactory.

All our product is of the first quality, and is the only American Portland Cement that meets the requirements of the U. S. Government and the New York Department of Docks We make no second grade or so-called improved cement.

ATLAS CEMENT COMPANY, 143 LIBERTY STREET, NEW YORK CITY.



Holy Trinity Parish House,

PHILADELPHIA.

◆◆

Buff and Pompeian Brick Laid in Clinton Hematite Red.

◆◆

Messrs. Hewitt & Bro., Architects,
PHILADELPHIA.

◆◆

Messrs. Dorsey & Smith, Builders,
PHILADELPHIA.

◆◆

. . ILLUSTRATION FROM . .
"A Little Talk on Metallic Paints and Mortar Colors."

Write for this book, mailed free on application to the Publishers,

. . . . THE . . . .
CLINTON METALLIC PAINT CO.,
OF CLINTON, N. Y.

. . . . MANUFACTURERS OF. . . .

High Grade Mortar Colors and Metallic Paints.

Eastern New England Agents:
FISKE, HOMES & CO., 164 Devonshire Street, - - - - - BOSTON.

favorable circumstances is an expensive operation), and also without the aid of a diving bell or submarine armor.

On account of its continuity, impermeability to water, it is well suited to the purpose of a substratum in soils infected with springs, for sewers and conduits, for basement and sustaining walls, for columns, piers, and abutments, for pavements in areas, basements and cellars, for walls and floors of cisterns, vaults, etc. Groined and vaulted arches, and even entire bridges, dwelling-houses and factories, in single monolithic masses, with moulded ornamentation of no mean character, have been constructed of this material alone. Concrete is composed of natural hydraulic cement, under circumstances requiring only a moderate degree of energy and strength, paste of fat lime is sometimes added in quantities seldom exceeding that of the cement. Coarse gravel and broken stone are almost invariably used as the basis of concrete, and when made it is at once deposited in its allotted place, and well rammed in horizontal layers of about six inches in thickness, until all the coarse fragments are driven below the general surface. The ramming should take place before the cement begins to set, and care should be taken to avoid the use of too much water in its manipulation. The mass, when ready for use, should appear quite coherent, containing water however in such quantities that a thorough and hard ramming will produce a thin film of free water upon the surface under the rammer, without causing in the mass a quicksand motion. It will be found in practice that cements will vary considerably in their capacity for water, and that fresh ground cement requires more than those which have become stale. An excess of water is however better than a deficiency, particularly when a very energetic cement is used, as the capacity of this substance for solidifying water is great. A too rapid desiccation of the concrete might involve a loss or cohesive strength if insufficient water be used.

In the preparation of concrete the cement and sand should be thoroughly mixed first dry; then add water gradually, and mix to a plastic mortar; the broken stone should be dampened by sprinkling, when all should be thoroughly incorporated and carried as quick as possible to the trench, and rammed as above described. Subjoined is an analysis of concrete used under the supervision of some of the best authorities upon the matter: —

1 barrel German Portland cement (395 lbs.).
5½ barrels damp and closely measured sand.
6 barrels gravel and pebbles.
9 barrels broken stone.

One batch of this concrete makes fifty cubic feet rammed concrete.

This concrete is of first-rate quality, being compact, free from voids, and strong. It is richer in mortar than would be necessary in most cases.

Another recipe for concrete is as follows: —

1 barrel Boulogne Portland cement (400 lbs.).
1¼ barrels slaked ground lime in powder.
8 barrels loosely measured sand.
16 barrels pebbles and gravel.
16 barrels broken stone (2′ cu.).

One batch of this concrete will make one hundred and five cubic feet rammed concrete of suitable quality for most kinds of massive work. It contains the greatest admissible proportions of gravel and broken stone. The quality of this concrete would be improved by using eighteen barrels of gravel and fourteen barrels of broken stone, instead of sixteen barrels of each. This concrete possesses a crushing strength of 220 pounds to the square inch when two months old, the pressure being applied to five-inch or six-inch cubes. One part Portland cement, three parts sharp, clean sand, and five parts broken stone are proportions used in some of the massive works in this country.

From the above practical recipes the mason can modify them to answer any practical purpose, and arrive at the cost of the same, knowing the price of materials in different parts of the country.

R. N. BUELL.

NEW BRITAIN, CONN.

LAWRENCE CEMENT CO.
No. 1 BROADWAY NEW YORK
"HOFFMAN" ROSENDALE
SUPERIOR FOR WORK UNDER WATER
STANDS EVERY HIGH TEST
ADAPTED FOR HEAVY MASONRY
MADE FROM THE BEST ROCK
ALWAYS RELIABLE
UNIFORM IN QUALITY
STRONGEST OF AMERICAN CEMENTS

Alsen's Portland Cement.

The strongest, finest ground, and most uniform Cement in the world. Permits the admixture of more sand than any other, and is the best for mortar or stuccoing.

143 Liberty Street, = = New York.

Peerless Mortar Colors,

RED, BLACK, BROWN, AND BUFF.

Our New Colors are novel and attractive and well worthy of attention.
MOSS GREEN, ROYAL PURPLE, POMPEIIAN BUFF, FRENCH GRAY, COLONIAL DRAB.

All Colors Permanent and Superior to any Article in Use.

SAMUEL H. FRENCH & CO.,

Painters' and Builders' Supplies,

ESTABLISHED 1844. PHILADELPHIA, PA.

SEND FOR CIRCULAR AND CATALOGUE.

CLEVELAND IRON ORE PAINT CO.

C. I. O. P. CO.
TRADE MARK

MANUFACTURERS OF
HIGH GRADE
MORTAR
COLORS.
ALSO,
Metallic and Graphite Paints,
IN ALL FORMS.

SEND FOR CIRCULAR AND PRICEILIST No. 34.

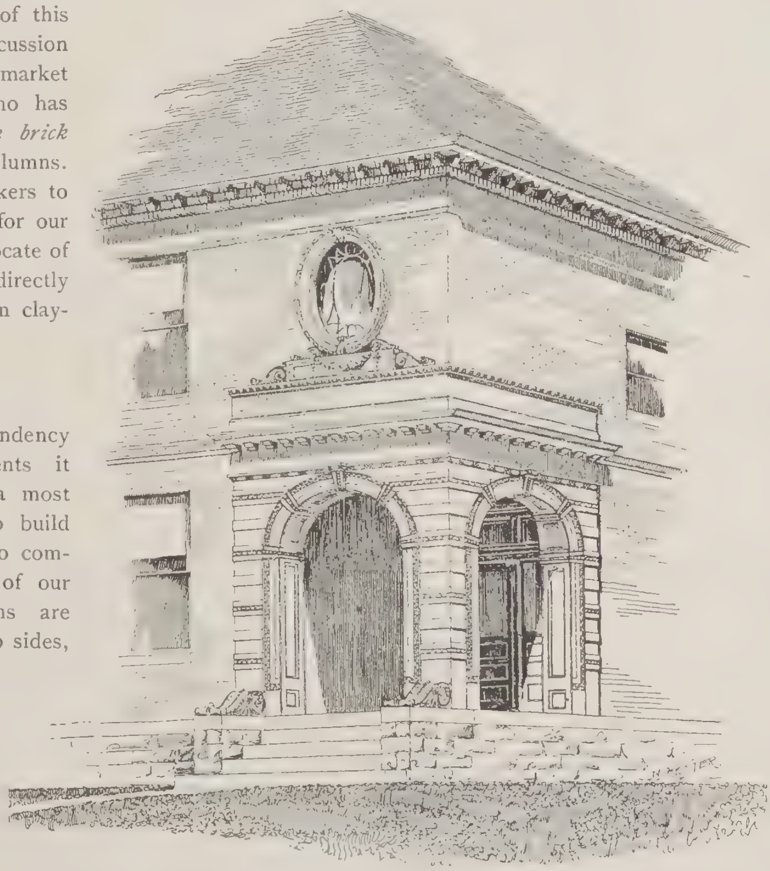
Cleveland, O.

THE MANUFACTURER.

A Department devoted to the Market Side of Clay Production.

OUR RELATION TO THE MANUFACTURER.

THE manufacturing side of the clay-working business is already well taken care of by several periodicals. The market side, previous to the publication of THE BRICKBUILDER, has been neglected. It is the purpose of this paper, from cover to cover, to advocate the use of clay-building materials, and, by presenting their merits in every conceivable way, induce owners, architects, and builders to use them wherever possible to the exclusion of other materials. THE BRICKBUILDER will, in short, use every legitimate means to increase the consumption of brick, tile, and terra-cotta. Its success in this direction means more business for the manufacturer, necessitating more and better machinery, and greater drier and kiln capacities. It means the establishing of new yards where there are none at present. We therefore expect the hearty support and co-operation of every clay-worker and every manufacturer of brickyard equipment who wishes to see a larger and more general use of clay products. The columns of this department are open to the discussion of all questions relating to the market side. Every manufacturer who has a suggestion for *selling more brick* should put it into these columns. We especially request clay-workers to subscribe to, read, and write for our paper. Its success as an advocate of architecture in clay materials directly benefits every one interested in clay-working.



CORNER OF RESIDENCE, CINCINNATI. A. O. ELZNER, ARCHITECT.
For Scale Drawing see Plate 67.

BRICK FOUNTAINS.

WITH the present tendency towards brick pavements it occurs to us that brick is a most proper material with which to build the little drinking fountains so common on the streets of some of our cities. When these fountains are built at the curb, and have two sides, one for horses, the other for people, a number of effective schemes for treatment immediately present themselves. When the combination with terra-cotta is considered, the number is doubled.

It is a serious mistake to think that small things like this cannot come in for brick treatment. Of course the saving would be nothing, but if well done, all brickmakers would have a standing advertisement of their business, where thousands could see and admire the work daily.

BRICKS FOR FENCES.

NO hard brick can be too bad to use for the construction of boundary walls. The crookedest, over-burnt, discolored bricks, if used intelligently, will go. It took architects of the highest reputation to establish this fact beyond any question by using such brick in one of the finest examples of brick gateways in America. They did not pick up a single brick and squint along its edge; nor did they think for a moment of fine mortar joints. They saw the work already completed when they took these cull brick and only considered the effect of the wall surfaces. Don't destroy culls. Sell them for particularly choice stock. You can, if you know how.

A SUGGESTION.

DO the architects and builders of your section recognize the important place brick is taking as a material, not only for construction, but for architectural effect? Do you not think there have been and are constantly occurring instances where they might use brick instead of wood, stone, or metal? If in one of these instances brick *had* been used, and you had made the sale, what would the profit have been?

This paper is published with a view (next to that of making money) to inducing architects and builders to think of brick for all classes of buildings, in preference to anything else. It publishes towards that end numerous examples of what has been and what is being done in brick architecture. It is decidedly to your advantage to have a copy of it sent regularly to every architect and builder in your section. As an advertisement nothing could be better than to send the paper, with your compliments, to the architects and builders. We will send five copies for one year for ten dollars, and on larger lists will make considerably lower rates. It will pay you to try a list of five. Many have already done so at our suggestion, and have found the result everything and more than we prophesied. It is a little courtesy to those architects and builders who have dealt with you more or less that goes a long ways to keep up friendly business relations.

OUR ILLUSTRATIONS.

THE residences illustrated on the following page, and referred to in our Cincinnati letter, are good examples of solid, comfortable-looking brick houses. They are both rather expensive and not so "bricky" in character as we would like to see. The cut on this page is a suggestion of an attractive corner entrance made by a combination of brick, stone, and terra-cotta. Many of the other illustrations will be of interest to our manufacturing readers. We would call particular attention to the fine full-page plate of the Cloister of San Zenone, as showing how very effective brick arches of rough, common brick may be made. Read what Mr. Street wrote about this cloister after having seen a great many (some of finest marble) in all parts of Europe.

OUR special double number containing plans for eight $2,000 brick houses awarded prizes in competition will be sent upon receipt of fifty cents.

RESIDENCE OF DR. C. D. PALMER, AVONDALE.
G. W. RAPP, ARCHITECT. (See page 180.)

BUILDING *VERSUS* PAVING BRICK.

AT this time, when so much is being written about paving brick, when manufacturers are changing or adding to their plants so as to produce pavers, when beds of good paving-brick clay are being opened up by the score, the question arises whether the importance of the paver as a factor in the brickmaking business is not overestimated. We do not for a moment contend that brick is not the best paving material, and that it should not be pushed for all it is worth. The question is whether its novelty is not giving it an apparent importance equal to the building brick from which the novelty wore off some two or three thousand years ago. The same energy in placing contracts, the same earnestness in argument for its use, the same care in filling orders, the same strong fight to oust other materials and install this, would result in a far greater and steadier volume of business in building than in paving brick. But building brick is old; it has won its battle on its merits, and needs no more attention. So argue many to whom it is suggested that the demand for it may be doubled or tripled. *Not by any means.* These same ones would present most logical reasons why brick is better than wood for paving. Why can they not make as strong a case against wood in building? The opportunities for introducing building brick are a hundred to one for paving brick. Usually where brick pavements are laid, both sides of the street are or will be in the near future a solid row of buildings. On residence streets where brick pavements are laid the houses are usually built closely together, and during the life of a brick pavement, at a conservative estimate, twice the quantity of brick will be laid in the buildings on either side. Yet this market seems hardly worth striving for, the average brickmaker plodding along with too much clay on his feet to ever "get a move on" in any direction.

BRICKYARD OFFICES.

SOME months ago *The Clayworker* published a photograph of a small, commonplace frame building, calling it a "cosy" brickyard office. One of that paper's readers promptly sat upon not only the office, but *The Clayworker* too, in a communication to the correspondence column. He rightly said "that ugly frame house would not do credit to a third-class lumber yard." Why is it that brickmakers, of all persons, absolutely refuse to use brick in their own buildings?

As *The Clayworker* correspondent says, when they don't build of wood they build of stone. There is, so far as we can see, no reason for a well-established brickmaker having anything but a good brick office. Such an office should be so built that it would be reasonably fireproof, and if possible it should possess some architectural character and display to best advantage the bricks made in the yard. If a skilful architect were employed, this office might be made to serve the double purpose of building and exhibit, showing effective ways of using the material for ornamental work. A wall along one side, built of culls and bats, as has often been described, with a clematis or some other flowering vine trained over it, would be a standing advertisement for this part of the output.

TWO SHADES.

A BRICK manufacturer of common brick who can put two colors that harmonize or contrast agreeably, or two shades of the same color on the market, gives architects and builders a perfectly unlimited range of decorative effect in allover patterns, bands, and friezes, panels, etc.; and to help such manufacturers sell these brick for this class of work we shall, in our contractors' department, which we hope will be opened next month, begin a series of attractive designs.

RESIDENCE ON PRICE HILL.
W. M. AIKEN, ARCHITECT. (See page 180.)

TO INCONSISTENT BRICKMAKERS.

THE brickmaker who, building for himself a house, makes it of wood or stone should expect small success in selling brick for other people's houses. If *he* has not confidence in the material he makes, who else can have it? By building a frame house he may think he is saving money by the smaller first cost. But is not a good brick house cheaper in the long run? What a strong advertisement for his brick would an attractive home be! In the average city and large town those houses are most copied that are the most attractive to the public. Would it not be a good investment to have one of the best architects design your house with a view to making it one of the features of local interest, which your townspeople would point out to visitors as a particularly pretty house? With such an example before them, would not the brick houses multiply, and who would be the gainer? On the other hand, consider what building a frame house means to your business rivals! The lumberman will gladly sell you lumber, and every one else too. He wants no brick houses, unless it be his own. He makes a sale, and you don't. The carpenter contractor gets a good contract, and your friend and best customer, the mason contractor, has a little chimney work instead of the good contract that he should have. The painter gets in his work, and he is no friend to your business either. Perhaps you have a mantel or two. Some woodworking firm makes $50 or $100 on this, and some brother clay-workers, who have sunk time and money in learning to produce beautiful brick or terra-cotta or Faience mantels, get the cold shoulder.

But it does not stop here. You lay board walks or asphalt ones. Why not brick? Why all this fuss over brick for street pavements, if they are not good enough for walks? Perhaps you buy of some iron foundry a garden vase, or, worse yet, a fountain. Why not the same in terra-cotta? Your fence — what is it? Perhaps plain wooden pickets; perhaps iron; or very possibly that worst of all fakes, the heavy wooden balustred fence with massive gate posts, *painted brown and* SANDED. Here again your *friend* the painter has a regularly recurring job, until the wood rots, or the fence gets out of true and at last falls down. This may be a little extreme for the majority of cases, but there are many it fits. The motto of every brickmaker should be, *Brick house, tile roof, terra-cotta mantels, brick walks, and brick fence.* This need not be monotonous. You have as much variety of treatment at hand in your material as you can get by a combination of all materials, and you will be consistent. Your arguments will then be backed by something substantial. The good salesman must thoroughly believe in the article he sells. You must be a salesman as well as a producer. If you don't believe in brick, what do you believe in? Above all things, be consistent.

TRADE NOTES.

Yard Equipment.

LEWIS BROTHERS of Tallahassee, Fla., will develop a cement rock near River Junction in the same State.

THE Simpson Brick Press Company report having made several large sales of machinery in Europe.

A "NEW HAVEN" machine goes into the works of the Elmwood Brick Company, near Hartford. The McLagon Company keep a good grip on New England business.

FIRE scorched the Trenton (N. J.) Potteries Co., Seth L. Scholl, Lansdale, Pa., and D. Semerling & Co., Chicago; and destroyed C. W. Montgomery's plant at Iron Mountain, Mich., American Terra-Cotta and Ceramic Works, Terra-Cotta, Ill., Wisconsin Red Pressed Brick Co., Menomonee, Wis. (Kilns only.)

NEW YARDS. — A. F. Mc. Connell, Decatur, Ala.; W. M. Singerly, Frenchtown, Md.; Woodland Red Clay Pressed Brick Co., Janesville, Wis.; Brown & Fraser, Tampa, Fla.; Prosperity (S. C.) Ginnery & Mfg. Co.; McVean, King & Co., Smithfield, Tex.; Columbian Brick Co., Syracuse, N. Y.; C. E. Bonsor, Fredericktown, Mo.; Lorain Brick Co., Sheffield, O.; Des Moines (Ia.) Co-operative Brick Co.; Washington (D. C.) Brick Co.; Terre Haute (Ind.) Brick and Pipe Co.

RECENT PATENTS.—Automatic cutter for brick and tile machines, Davis Brown, Decatur, Ill. (ass. one half to Decatur Leader Mfg. Co.). Brick mould, Jos. B. Mowry, Mansfield, O. (ass. one half to J. F. Stine). Brick machine, Samuel E. Haskins, Avoca, N. Y. Brick machine, Albert D. Thomas, Keokuk, Ia. (ass. to H. O. Whitney). Brick and tile cutter, Horace A. Riggs, Plymouth, O. Refractory brick, Alfred E. Hunt, Pittsburgh, Pa.

Clay Materials.

THE DESIGNING AND CARVING COMPANY, for the manufacture and sale of models of clay, has been incorporated at Baltimore, Md.

MANAGER EUGENE R. ATWOOD, of the Atwood Faience Company, gave us a call recently, and reported good progress in the equipment of their new plant at Hartford.

THE NEW YORK ARCHITECTURAL TERRA-COTTA COMPANY will make the brick and terra-cotta for the new Worthington building on State Street, Boston.

FISKE, HOMES & CO. are to make the terra-cotta for the new Parlin Memorial Library. They are now getting out some very fine details for the Lauderdale building, Providence.

WM. H. GRUEBY has made some particularly good pieces of glazed ware lately, getting quiet tones and dull finishes that will be very useful to architects.

W. H. GATES has added to his line the white brick of the Powhatan Company. He is now supplying buff front brick for a block of houses on St. Botolph Street, Boston.

THE entrance to the new Castle Square Theatre, Boston, designed by Winslow & Wetherell, is an imposing triumphal arch motive in white terra-cotta, with large figure panels. The New York company did the work.

IF any architect wants a 4 x 12 x 1 or 4 x 12 x ¾ brick in almost any shade, let him try Fiske, Homes & Co. There are numberless ways in which such a brick can be most effectively used. This firm has its new catalogue nearly ready.

THE American Terra-Cotta and Ceramic Co., who experienced a disastrous fire at their works at Terra-Cotta, Ill., will soon be rebuilt and in full swing. Some of the enamelled work they are producing is highly successful, especially interior details, such as mantels.

THE Cambridge Temple, by Blackall & Newton, will be very much the same kind of building as the Tremont Temple, but the design is in a different style, Venetian in character. As a terra-cotta job, while not as large as the Tremont Temple, it is enough to satisfy any reasonable company.

THE Standard Terra-Cotta Company of New Jersey have opened a Boston office, in the Equitable Building, Mr. Peterson taking charge of their interests here. This company manufactures architectural terra-cotta in all its branches to match all colors of brick. Mr. Peterson also handles a superior quality of front brick.

THE Bay State Tiling Company, on Boylston Street, is now representing the National Mosaic and Marble Co. in Boston. Mr. Terry, when here a few days ago, showed us the drawings for a four-story business block being erected at Stamford, Conn., the entire façade, columns, capitals, lintels, etc., being made of mosaic marble by their process.

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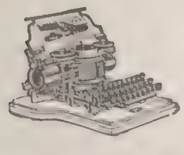

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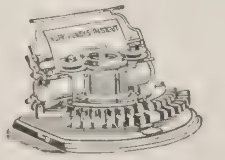

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THE BRICKBUILDER

Vol. III. BOSTON, OCTOBER, 1894. No. 10.

ON THE USE OF BRICK IN ECCLESIASTICAL ARCHITECTURE.

IT is undeniable that a very distinct prejudice exists against brick and terra-cotta in ecclesiastical architecture,— a prejudice which very largely prevents the use of these permanent, fireproof, universally accessible, comparatively inexpensive materials in any church work, save that of the Roman Catholics and of certain of the Protestant denominations. Now I believe that this prejudice, though originally justifiable, and almost unavoidable at one time, is very unfortunate and no longer to be defended; therefore I wish to enter a plea for the use of materials which possess so many elements of excellence, and which are at present, in this connection, so grievously misjudged.

Let us see why this feeling exists. The reasons are not hard to find. They are, it seems to me, three in number: first, the lamentable nature of most contemporary ecclesiastical brickwork; second, the instinctive prejudice against a material which appears to be wanting in precedent, together with the feeling that brick and terra-cotta are not adaptable to the Gothic style; third, unfamiliarity with the possibilities of the materials.

Let us briefly consider these in order. In the first place, it is hard to see how an intelligent architect or building committee could help being prejudiced against brick in this connection, in view of the ecclesiastical horrors that are so much in evidence. The architects of modern Roman Catholic churches manifestly have no scruples against using brick, which is, in a way, unfortunate; for nothing worse from a religious, artistic, or educational standpoint could be imagined than the barren, idiotic, and blasphemous atrocities that deface the innocent landscape and misrepresent the Church. In this particular class of work, brick is used with no knowledge or appreciation whatever of its possibilities. A very hard, smooth face-brick, laid in American bond, with white granite trimmings and galvanized iron ornamentation, is the accepted formula; a sight of one of the resulting dreary and impious structures is about enough to impel a sane observer to refuse brick for church work forever.

Nor is the ordinary religious edifice of many of the denominations much better when brick is used. Here the cherished red face-brick of the Roman Catholic architect gives place to the blotched and mottled and spotted, yellow and snuff-colored and orange "Roman bricks," so dear to the heart of the newly fledged architect. Now the white granite trimmings yield to richly moulded terra-cotta, a dead red color probably, and with equal probability modelled in the "tasty" style of the mortuary sculptor. The tawdry, uneasy, undignified result is not edifying, and it is small wonder that many men, looking aghast at these examples of brick church work, finding them to possess no single element of historical suggestion, beauty, or morality, forsake forever burnt clay and all its works.

Now, of course, misuse of a material does not argue impossibility of right use. A wall of soft-surfaced, stone-gray brick, laid in English or Flemish bond, with gray mortar in wide joints, is just as fine and dignified a wall as one of stone. Possibly it is not as beautiful, but it is equally strong, just as durable, and much cheaper: and this last argument is not to be disregarded. It *is* more dignified and beautiful than the popular rubble or quarry-faced work, which, except in the most rural localities, is inadmissible. There are many shades of good brick now available, ranging all the way from dark red through the browns to light gray; and though the cream bricks can seldom be used except under very particular circumstances, and the hot, yellow, mottled bricks almost never, still the range of colors is large, and bricks are easily obtained which have the rough surface, quiet tone, and varied color which are to be found in ordinary building stones.

In the matter of terra-cotta, the same holds good. The cheap, red, mushy stuff affected by the "tabernacle" and the "temple," and the flaring white Renaissance products consecrated to hotels and club-houses, are not all there is obtainable. There is a gray terra-cotta which is perfectly adapted to Gothic work, particularly to window tracery; and though no modelled ornament can ever equal fine carving in the solid stone, it is oftentimes far better than the coarse and crude, or weak and lifeless apologies that are offered by the ordinary stone-cutter.

For window tracery alone terra-cotta is invaluable. It does not pretend to be stone, but it is absolutely permanent, and infinitely to be preferred to the makeshift and hypocritical wooden work which is only justifiable when it is considered as a temporary stop-gap.

Again, I do not believe that brick and kindred materials are impossible in interior work just because we have a few forbidding examples of pressed brick interiors which have nothing to commend them. The confusing, spotty effect of brickwork when seen close at hand, particularly where it is not subject to the mellowing influence of the weather, militates against its use in this particular instance; but I am confident that experiments and experience will make possible the use of brick and terra-cotta for interior work, though at present we have hardly an example of its successful application. If a brick or large slab of terra-cotta, say one foot by one foot eight inches, could be obtained, it might obviate the now distinct difficulties.

Coming to the second reason of the prejudice against brick, objection to it on historical grounds, it seems to me that there is less excuse than in the first case. If architecture is anything but a fad, it is a living art, based on precedent and history it is true, but adapting itself absolutely to modern conditions and demands. An architecture which is unerringly archæological is just as unworthy as one that is entirely "emancipated." During the great periods of Gothic or Christian architecture in the North, brick was not available, neither was it necessary. The time was not yet come when personal extravagance and luxury had made thrift and economy necessary in religious duties, and therefore stone, and the *best* stone, was not thought too good for a church. Now, however, conditions have changed, and cost must be counted in every instance. As a result wooden churches must do in many cases; for the money that would formerly have been generously given is now lavished on the private dwelling and the club-house, and there isn't much left for God. Under these circumstances the tremendous advance in brick-making seems to be a very fortunate thing, for it makes possible a dignified and permanent structure in place of the scandalous wooden makeshifts that do small honor to our religious sense. There isn't the least doubt but that the church builders of the fourteenth and fifteenth centuries would have used this material gladly under the same conditions that confront us, and out of its very limitations they would have created triumphs. In the South of Europe it *was* used and with most noble results, and it is just as applicable in the North as there. Because it was used only in the work of the early Renaissance in Italy, it does not follow that it might not have been used equally well in the developed Gothic of England and France, or that it might not be used in the Restoration work of the present day. In reasonably competent hands it could not help being immeasurably better and more dignified than the silly and affected rubble work that is so popular now under the mistaken idea that it is "rural" or "picturesque," while as a matter of fact it is only absurd. For any work except that of the roughest and most brutal nature, it is absolutely necessary that the wall surfaces should be nearly smooth, and the only way this effect can be obtained, except at the great cost of dressed stone, is by the use of seam-faced stone or brick; the former is not always obtainable, the latter always.

And obtainable in good shape, for the special and expensive bricks are by no means always the best in effect. A good common brick, varying to any extent in color, laid up in Flemish or English bond, makes a fine wall, quiet, reserved, and dignified. Also it is cheap, or would be so beyond competition, if only the brick manufacturers would make their bricks of a size which would make an honest bond possible without chopping half the bricks. If common bricks came, say 2 in. x 4 in. x 8¾ in., or 1⅞ in. x 3⅞ in. x 8 in., a wall could be laid up in a good bond for just about the cost of the ordinary wall, which really isn't bonded at all, except perhaps every five courses, or else by metal makeshifts. It is strange that so small a change as this, and one which would increase the popularity of brick so largely, is not made. The ordinary unbonded wall is ugly, and will forever remain so. The Flemish or English bonded wall is beautiful in itself, as well as strong and sane in construction. I really believe that much of the unpopularity of brick comes from the impossible shapes, and for these the manufacturers alone are responsible.

As for the third reason that I have assigned, there is unfortunately nothing to be said. If architects will only look up the matter they will find a lot of good bricks, good in everything but shape, easily available, and they will surely realize that there is no reason, architectural or otherwise, why brick should not be used in church work without hesitation; while by refusing it they are only injuring themselves, since they are compelled either to build useless wooden structures or else to spend their allowances on heavy walls of stone which, nine cases out of ten, are unsatisfactory in final effect, owing to the fact that money is not forthcoming for anything but quarry-faced stone, — an ecclesiastical abomination.

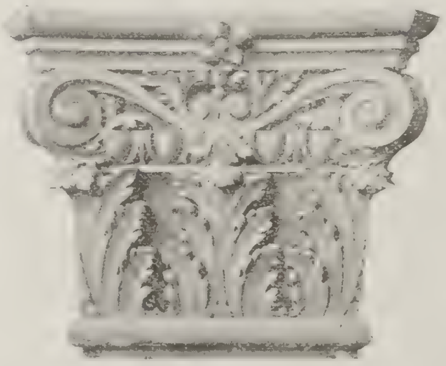
The same holds good in terra-cotta, and if architects will forget the mushy stuff that is so often the only thing common in this material, and forget also the horrors in "quarry-faced stone brick" and their ilk, they will, I am sure, find that they have been carelessly throwing away a great chance for noble work.

Of course there is another factor to be dealt with, the building committee, and here at present reform seems almost hopeless. I have never found yet a building committee that would consider brick for a moment, and from their standpoint, that of observers of contemporary ecclesiastical brickwork, I can't blame them. In England this prejudice has been overcome, and it must only be a question of time in America before the same result is achieved here. There is too much to be said in favor of brick, too little against, to allow the present prejudice long to continue.

Let us look at these favorable points a little more carefully. In the first place, brick is absolutely permanent, fireproof, and solid. Good brick will endure pretty nearly forever. This is a great point; for if a church should be anything, it should be honest and permanent. In the second place, it is easily obtainable, for there is no place in this country where it cannot be procured with the greatest ease. Of its rivals, dressed stone and seam-faced stone, or stone that has a flat cleavage, the first is very expensive, the second not to be obtained everywhere, by any means. Quarry-faced stone I can't look on as a rival, for it has no historical precedent whatever, and is uneasy and undignified in effect. In the third place, brick is comparatively cheap. By using it an architect is able to obtain a substantial and beautiful building, while the amount saved over stone enables him to provide richer mouldings and more elaborate carving in the trimming stone than would otherwise be the case, while he very possibly may be able to place terra-cotta tracery in his windows, and so get rid of the wooden abominations that are such a trial to his sense of fitness and honesty.

On the whole, it is hard to see what there is of adequate argument to be offered against this material. It is characteristic of this age, and being honest and dignified, the objections cannot be brought against it which can be adduced against iron and steel construction, and which must forever prevent their use in church work. For this reason it is the duty of the art of architecture to accept it, mould it to its uses, and make of it a building medium as worthy and honorable as stone has been in the past. It can never supersede this latter, for it can never give a surface as dignified as well-dressed sandstone or as beautiful as seam-faced granite, but it can take a worthy second position, superseding quarry-faced stone and rubble, and making possible in the vast number of cases strong, beautiful, and substantial churches, where now are wooden expedients or nondescript makeshifts made of stray stone walls and cedar shingles.

RALPH ADAMS CRAM.



WE published in our August number a circular window of terra-cotta in the Carnegie Music Hall, New York, and give herewith a capital from the same building. The architect is Wm. B. Tuthill of New York. The terra-cotta is dark buff, executed by the Excelsior Terra-Cotta Company of New York.

STA. MARIA IN COSMEDIN, ROME.

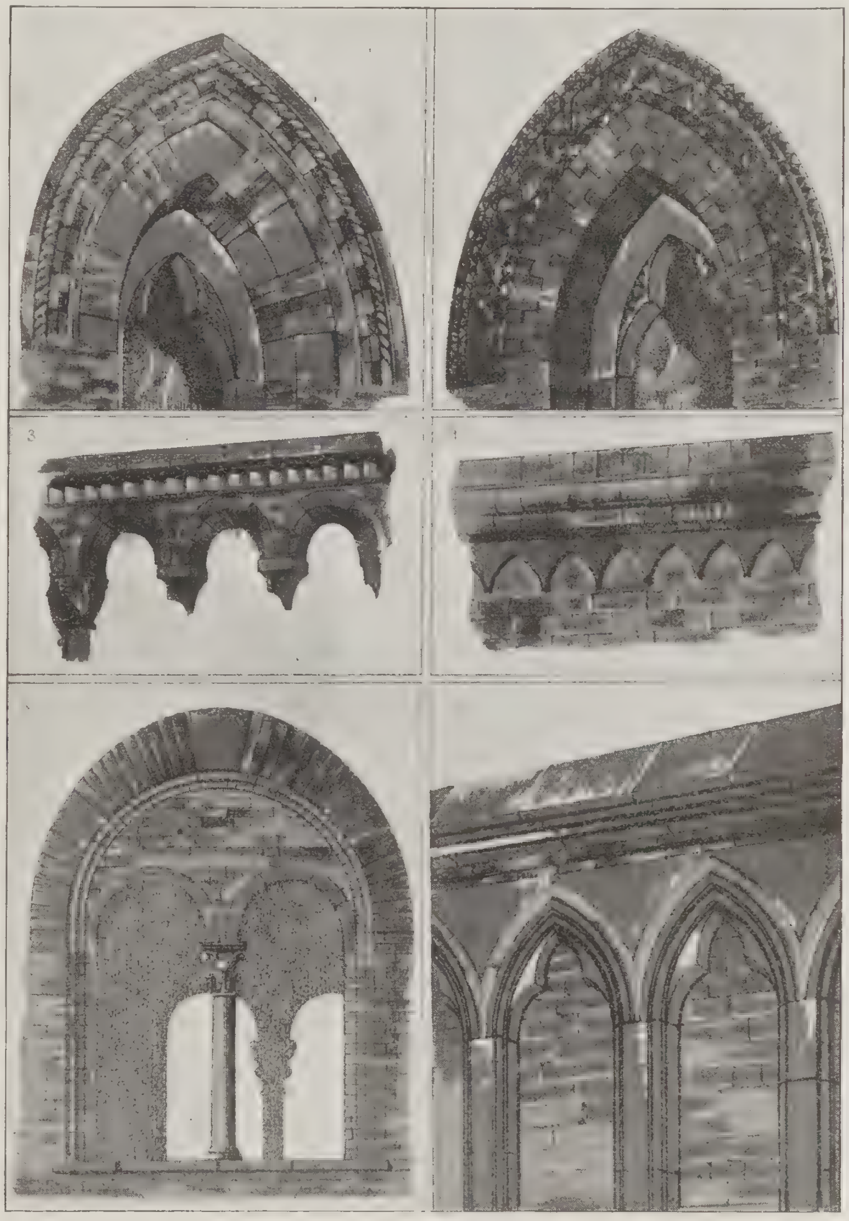
IT is with genuine pleasure that we call the attention of readers to advertising page vii, if by any chance they may have overlooked it. It is the first instalment of the new advertisement of the Hydraulic Press Brick, which was announced two months ago. The decorative border will each month enclose a new photograph of some interesting example of brick architecture. The present subject is the Basilican church of Sta. Maria in Cosmedin, built during the last years of the eighth century. The tower possesses particular interest as being one of the best of the many square brick towers attached to churches in Rome. It is only fifteen feet broad and one hundred and ten feet high. Ferguson says that, "notwithstanding this, there is a great dignity in the design, and, in a city where buildings are not generally tall, its height is sufficient to give it prominence without overpowering other objects."

BRICK AND MARBLE IN THE MIDDLE AGES.

CHAPTER VI. — Continued.

G. Edmund Street.

ON the way back from San Zenone into the city a small church is passed, — the oratory of the same saint, — where his body is said to have rested for a time before it was taken to the Basilica. The only architectural features are of a long subsequent period, a very good circular window in the west gable, and a doorway with a pointed canopy supported on shafts above it, under which of old no doubt there was a painting.



ITALIAN BRICKWORK.

1, 2. Windows at Verona.
3. Cornice, S. Ambrogio, Milan.
4. Cornice, Broletto, Brescia.
5. Window in Broletto, Monza.
6. Wall Arcade, San Fermo, Maggiore.

Beside San Zenone I think the only very grand church as yet unmentioned is that of San Fermo Maggiore, — a vast Romanesque basilica without aisles, but with small transepts, and a chancel and north and south chancel, — aisles opening into the nave by three arches, which exactly correspond with its vast width; a not very beautiful arrangement, which we shall meet with again in the church of the Eremitani at Padua, and in others of the great churches of the preaching orders of monks.

The fabric of the east end and the eastern half of the nave appears to be of very early date; I should be disposed to say the end of the tenth or beginning of the eleventh century. A lofty crypt is constructed under the whole of this part, all the columns of which are square; some of them mere masses of masonry, others slender monoliths. The mouldings here are rather Roman in character than Lombard. The groining is all of brick, and very extensive remains of paintings are still to be seen throughout, the large columns having single figures painted on them, one on each face. Access to the crypt is obtained (by the clergy) from the cloister, south of the church, and by the people through a very spacious staircase entered from the outside by a door just west of the north porch. So good indeed are the means of access, that no doubt the crypt was once extensively used by the laity, for whom these stairs were specially intended. It is now not used at all, — just as is the case with old crypts all over Europe, — but then it is fair to say that the church is no longer served by the Regular Clergy by whom it was built, and that their conventual buildings were when first I saw them occupied by Austrian soldiers, and are now still turned, I believe, to some equally secular use. I think we may fairly assume that in 1313, when the church was restored and in part reconstructed, the old crypt was retained partly on account of its associations, and partly because of its convenience for those who might at first not quite sympathize with the novel arrangements of the church above, a great unbroken area built and contrived for the use and convenience of an order of preachers, and not for receiving a number of altars.

A monument close to the entrance of the crypt is worth notice. It represents a professor with his pupils sitting each at a desk. The books have inscriptions on them. The professor's has "Vita brevis"; a pupil, "Ars longa"; another, "Judicium difficile"; and another, "Tempus fugit."

In the interior of the nave we have, as has been observed, a work which has been so much altered that it is in fact, as we now see it, a work of the fourteenth century. It is about fifty feet in width, and covered with a timber roof, constructed so as to form a ceiling of a number of cusps boarded and panelled on the under side, and tied with iron ties in place of collar-beams. Two vertical divisions of the panelling are arcaded and filled with paintings of saints, and the whole roof is darkly stained and richly painted. Beyond this the only very striking feature is the pulpit, which is corbelled out from the south wall about midway in its length. It is old and picturesque, and is surmounted by a delicately carved and lofty canopy, — the whole in marble. It is surrounded by wall paintings of about the same age, and presents a fairly unchanged example of what such combined works of the painter and the architect were in the palmy days of the fourteenth century. These paintings are of much interest. Behind the pulpit are the four doctors and the four Evangelists seated, the ascent of Elisha in a chariot of fire, and twelve prophets with scrolls. Under the canopy is the crucifixion.

Going to the exterior one finds on the north side two transepts, and north of the chancel a tower. East of the eastern transept and of the tower are small apsidal projections of Romanesque character, both of them in ruins and unused. The masonry here is different from that of the later work, being of alternate courses of single brick and of stone.

The exterior of the principal apse is very remarkable, and belongs to the fourteenth century. Each side has a steep gable with elaborate cornices, mouldings, and pinnacles, partly of stone and partly of brick. The gables are built with circular bricks, and there is a cusped circular window in each gable. Seen from the bridge which crosses the Adige close to the church, this picturesque east end is one of the most picturesque things in Verona. Unfortunately, the campanile does not equal in importance the church to which it belongs.

The west end will be best understood by the accompanying sketch.* It is constructed entirely in red brick and warm colored stone, and I confess that it impressed me most pleasantly, as having in its four delicate lancet windows some sort of affinity to our own English work. The north porch is very fine of its kind, and the jambs of its doorway are constructed of black, white, and red marble used alternately. The arcading against the walls is noticeable as showing the use of thin courses of red brick for the purpose of defining the lines of the stonework.

The monuments on each side of the west door are good simple examples of a favorite Italian type. They are, as we shall see, of all dates, and, even when developed to a great size, are still corbelled in the same way out of the walls. In the North of Europe we have no analogous treatment of monumental memorials, and this rather enhances their value. The arch to the monument on the left of the west doorway is painted in a charmingly simple Giottesque style, and there is a painting also behind a modern statue in the door arch, of our Lord surrounded by angels. In the arcades above the monuments there were figures of saints painted, with imitations of mosaic. All these details are worth mentioning in order to give some idea to those who have not seen Verona of the extent to which everywhere the eye is feasted with remains of early art. Indeed, one feasts uninterruptedly there on all that can delight the eye in form and in color.

With the mention of one more church I believe I may bring my notes in Verona to an end, and this is a small chapel which stands just opposite the south side of the Duomo, and whose name I could not learn. It is much like San Pietro Martire in its general arrangement, but remarkable for the exquisite beauty of its windows, the arrangement of the bricks and stonework in which is beyond all praise. These windows are constructed with trefoiled heads of stone, enclosed within an arch of mixed stone and brick, round whose outer edge runs a band of delicate terra-cotta ornament. The spandrels of the trefoils are filled in with refined sculpture, instead of being pierced with the dark eye usually found in northern Gothic. There is, too, an entire absence of mouldings, yet, notwithstanding this, the general effect is one of combined delicacy and richness of no common kind, so much does carefully arranged and contrasted color do for architecture. A third window is entirely of brick, save the trefoil head of the opening. The side elevation of this little chapel is very singular in its whole arrangement; there are three bays divided by pilasters, which finish at the top in an arcaded cornice of brick; in each of the two western bays is a lancet window, and the centre bay has in addition a doorway, and a corbelled out monument above it; in the eastern bay the window looks just like one of those curious English low side windows, as to the use of which we have had so many ingenious theories; the east end has no trace of any window, and is finished with a flat-pitched roof, and a brick corbel-table running up the pediment. There is no stone used except in the window-heads and arches.

There are many other churches in Verona on both sides of the river, and into several of them we went, but without finding any of equal merit to those which I have already noticed. Santa Eufemia has a fair west front, of late pointed, and we found one or two good cloisters just like those mentioned at Brescia. Other churches have fronts built, and interiors remodelled, by Sanmichele and his successors, in a style which by no means approved itself to me; others there were which I did not succeed in reaching† and there is one dedicated in honor of S. Thomas of Canterbury, which is not, however, otherwise of any interest; it has a very late Gothic west front, of poor character.

It is impossible to walk about Verona without meeting at every turn with windows whose design is similar to those so often seen in Venice, but the execution and arrangement are generally so inferior here to what they are there, that I shall defer saying much about them until I am describing the palaces and ancient buildings of Venice. They are almost always finished with ogeed trefoils at the top, and are arranged singly, or in couples or more together, and one above the other, the same in each story of the house; their mouldings are thin and reedy, and the carving of their finials, when they have any, is very poor. Examples of these windows will be seen by most travellers in the rooms of the Albergo delle Due Torre.

The views from the bridges across the Adige are very striking. The main part of the city is on the right bank, and the river describes nearly a semicircle round it. The opposite bank is only partially built over, and has a largish suburb, upon rather rapidly rising ground; beyond this the walls of the city are seen with occasional towers, and marked all the way by their serrated battlements climbing the irregular outline of the hills in the boldest fashion. Then crossing over to the other side and turning round, you see the thickly built city full of towers and churches rising far above the turmoil of the crowd below into the pure sky, and, by their number and size, making Verona one of the most striking old cities I know.

Of course no one goes to Verona without thinking of Romeo and Juliet. I fear, however, that when I was shown the Casa de' Cappelletti, a small inn in a narrow street, and asked to connect it in any way for the future with the creation of Shakespeare's brain, my fancy refused to be sufficiently lively to perform the required feat. The simple fact is that real relics not existing, the good people of Verona have wisely met the demand which Shakespeare has created, and have discovered a tomb for Juliet, and other reminiscences of the fair Veronese, which I dare say satisfy very well the majority of travellers.

At Verona, as in the other towns through which we passed in Italy, we were quite astonished at the number of misshapen dwarfs that we saw; we could not account for this at first, but I suppose it is because children, until they can walk, are tied up in rolls of linen so stiffly as to deprive them of all power of motion. The only wonder is how any of these unfortunate children ever manage to walk at all.

In the courts of the houses at Verona there are generally wells, with ingeniously contrived arrangements for enabling the occupants of the various surrounding houses and balconies to let down their buckets for water without themselves going down to the wells. There are guide-ropes to the well from each angle of the courts round which the houses are usually built, along which the buckets run, suspended by rings and held by ropes from the balconies, until they reach the iron-work over the well, and then fall perpendicularly down to the water.

I have visited Verona many times, and each visit seems to me to give greater pleasure than the last. I fear I have given but a faint idea of the indescribable charm which it has to all who are fond of early art. There is little which one can compare with the situation and surroundings of such cities as Venice and Florence, and yet I suppose most travellers would agree with me in reckoning the interest of these three towns as not far from equal, and greater in very many ways than that of any other Italian cities.

On this first journey we were driven away by bad weather which, when it sets in, generally continues for several days, and we left, inwardly resolving that no long time should elapse before we returned, — a resolution which has been abundantly and often fulfilled — and as the waiter at our hotel honestly told us that we should be very likely to find fine weather at Padua, whither we were next to journey, we took his advice, and then, getting into an omnibus contrived to hold thirty persons, and I should say at least twenty feet long, with four horses harnessed with long drawn-out traces to increase the already prodigious length, we were soon at the terminus of the Verona and Venice railway.

(*To be continued.*)

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* The sketch in the original is replaced by the photograph on Plate 73.

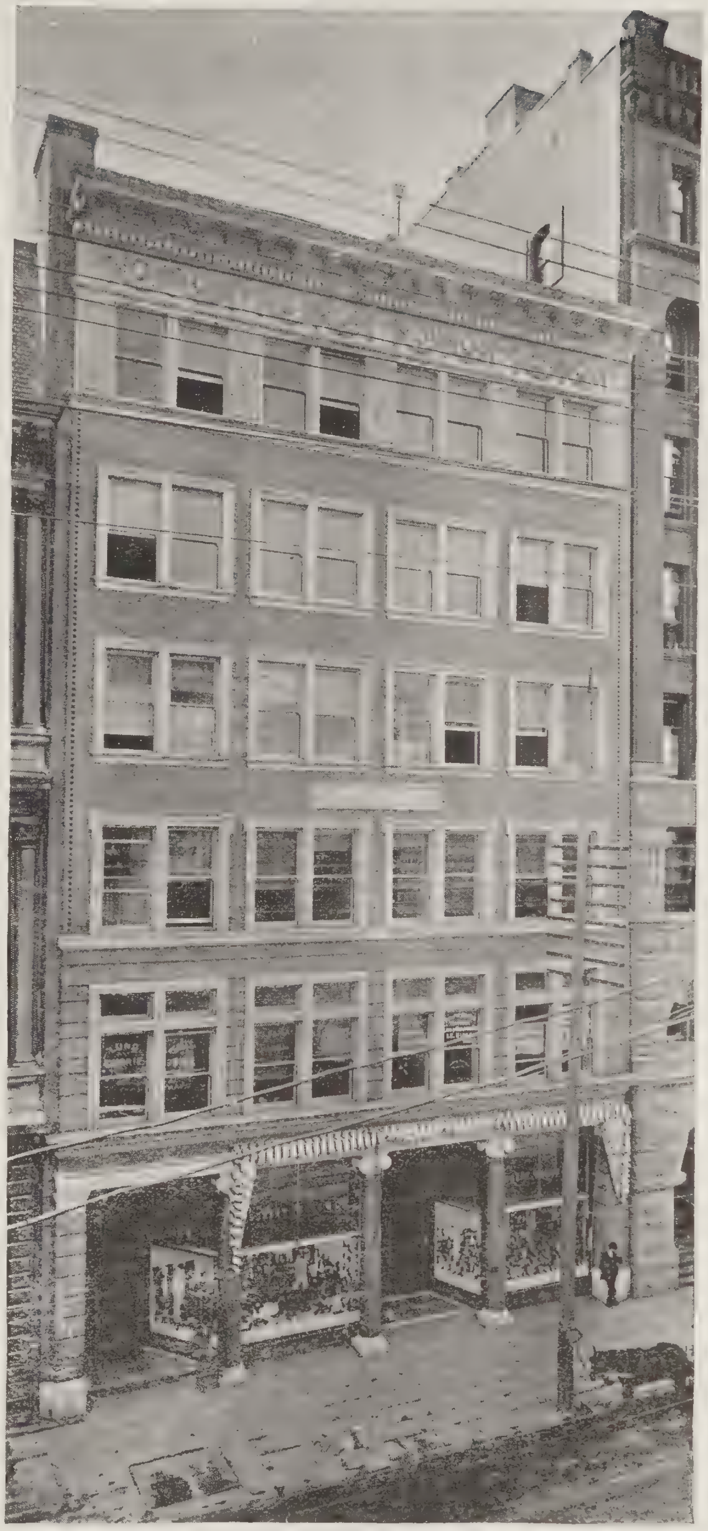
† The most important of these is the interesting church of San Stefano in the suburb on the opposite side of the Adige. It has been much modernized, but has still, I believe, an early crypt and an octagonal steeple over the crossing, of the same age as San Zenone.

RECENT BRICKWORK IN AMERICAN CITIES

PORTLAND, OREGON.

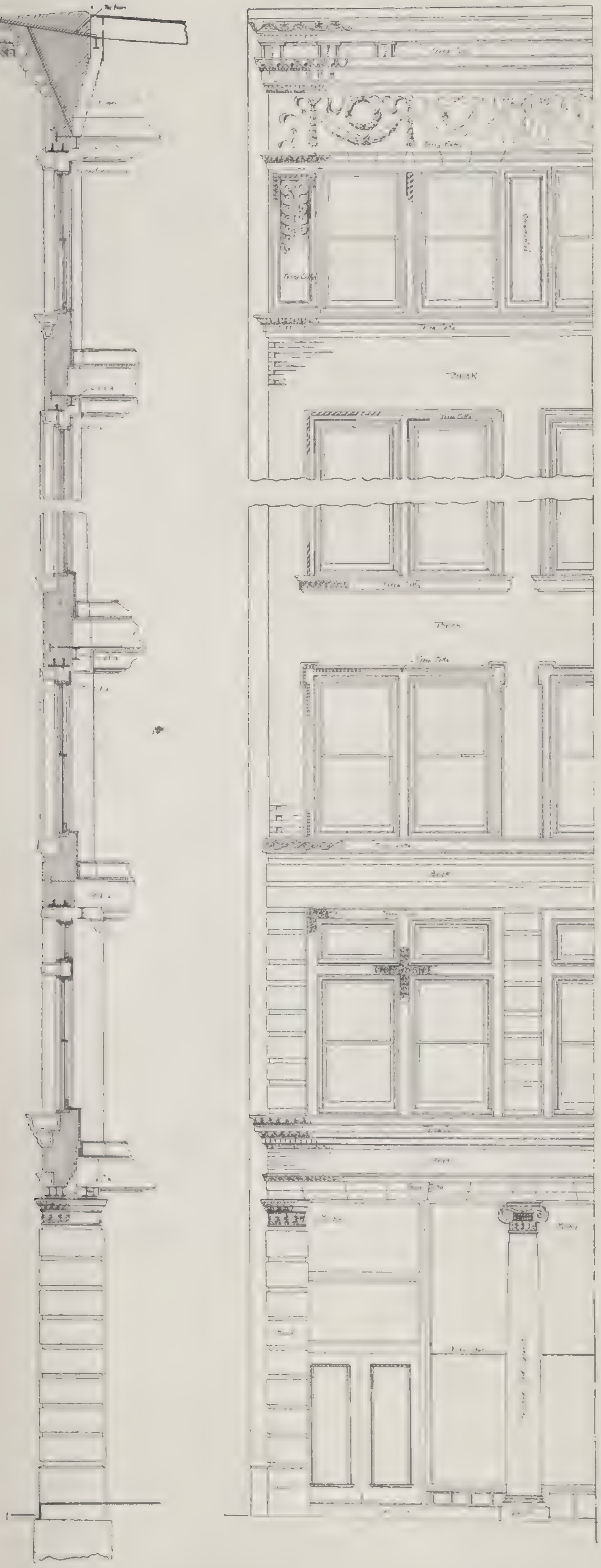
THE history of brick and terra-cotta in Portland is of a somewhat short period, the earlier buildings being of the style and character peculiarly in vogue on the Pacific coast, — usually a conglomeration or mixture of stone, brick, cast iron, and galvanized iron, with an abundant quantity of the latter for the purpose of decoration; all of the buildings, hardly without exception, having a cement plastering worked to a smooth surface, sometimes blocked to imitate stone and moulded for architraves and belt courses. The primary reason for the cementing is to exclude the moisture, which is a very important item in this climate, where the heavens weep, with but short intermissions, almost eight months in the year; not that there is a large fall in point of number of inches, but a continual drizzle, popularly and aptly termed Oregon mist. It is only within the last four or five years that ornamental brick and terra-cotta have been used in any degree of pretence to architecture.

Although contiguous to a mountainous country, stone is not so varied and abundant nor so high in quality as it would seem it should be. Clay, therefore, ought, next to wood (which is the king of products for this section), become the most important building material. As yet there has been but a small quantity manufactured for the purpose of artistic building material, which might be attributed to the scarcity of good clays, but, I think, rather to the heretofore lack of demand and probable want of capital. The greater part of face and ornamental brick and terra-cotta has been imported, some from the Eastern States, and more from California. Not a small number of common brick which, at the same time, if selected, make a handsome face brick, come from Japan. These brick are of a beautiful salmon red, larger than the domestic brick, the dimensions being two and one fourth by four and three eighths by nine inches, are of a good quality, and were obtained at a price that stood competition during the busy times. These brick have been used in several prominent buildings, and show off to fine advantage.



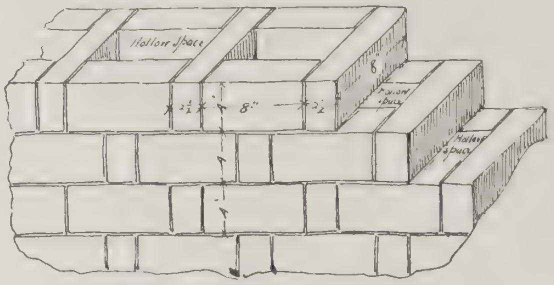
HAMILTON BLOCK, PORTLAND, OREGON.
WHIDDEN & LEWIS, ARCHITECTS, PORTLAND.

The method of construction in brickwork here is about the same as throughout the country, possibly having an advantage in the quality of lime which is made on Puget Sound, and which is hardly equalled in quality as well as price; also in the matter of cement, which usually forms the greater part of the cargoes of vessels coming here to load wheat and lumber. One of the peculiar methods of brick construction is found in a residence (illustrated). The walls rest on an ordinary foundation wall twelve inches thick, and are carried up two stories eight inches thick, laid with the usual Flemish bond, except that the brick are set on edge. This house has been standing for fifteen years, and stands to-day as well as the day it was erected. The builder claims it to be stronger than the same wall laid up eight inches thick in the usual way. It has the advantage of a hollow



DETAIL OF THE HAMILTON BUILDING, PORTLAND, OREGON.
Whidden & Lewis, Architects.
Reproduced to scale of one eighth inch.

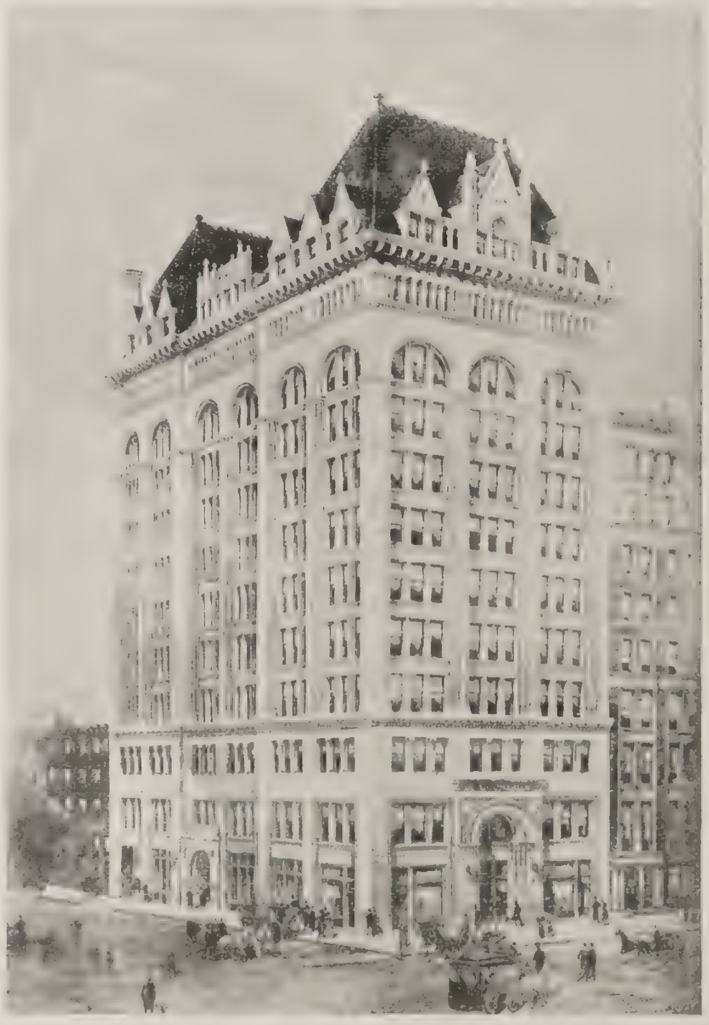
space from bottom to top, at which points are left openings for the free circulation of air during the dry season, this space being a very important item in the obstruction of dampness from the outside, the need of which has already been mentioned. The item of expense, which amounts to fully twenty-five per cent in the saving of material and about the same in labor, also seems an advantage for the ordinary class of residences and other light buildings.



Sketch showing method of laying brick

The progress in brick and terra-cotta can be seen in the Hamilton Block (illustrated). This building is faced with a mottled buff-colored Roman brick, trimmed with white terra-cotta of very ornate design, making a very handsome and effective piece of architectural work.

J. J.



PRESBYTERIAN BUILDING, NEW YORK.
Rowe & Baker, Architects.
Front Brick and Fireproofing Furnished by the Raritan Hollow and Porous Brick Company.

THE ART OF BUILDING AMONG THE ROMANS.

Translated from the French of Auguste Choisy by

ARTHUR J. DILLON.

CHAPTER II. — CONTINUED.

I.

VAULTS WITH ARMATURES WITH RADIATING JOINTS.

THE ribs with converging joints were made ordinarily of two kinds of brick, one square, of about two (2) ancient feet (a little less than than 6.0 centimetres) on the side, the other rectangular and about two feet by one half foot, or .15 centimetres. The ribs were built of the rectangular brick with an equal spacing of two feet between centres, and were joined together by means of the larger square bricks, as shown in the following figure (Fig. 18), making, as it were, a cage of open-work which may be taken as the best type of the armatures with radiating joints.

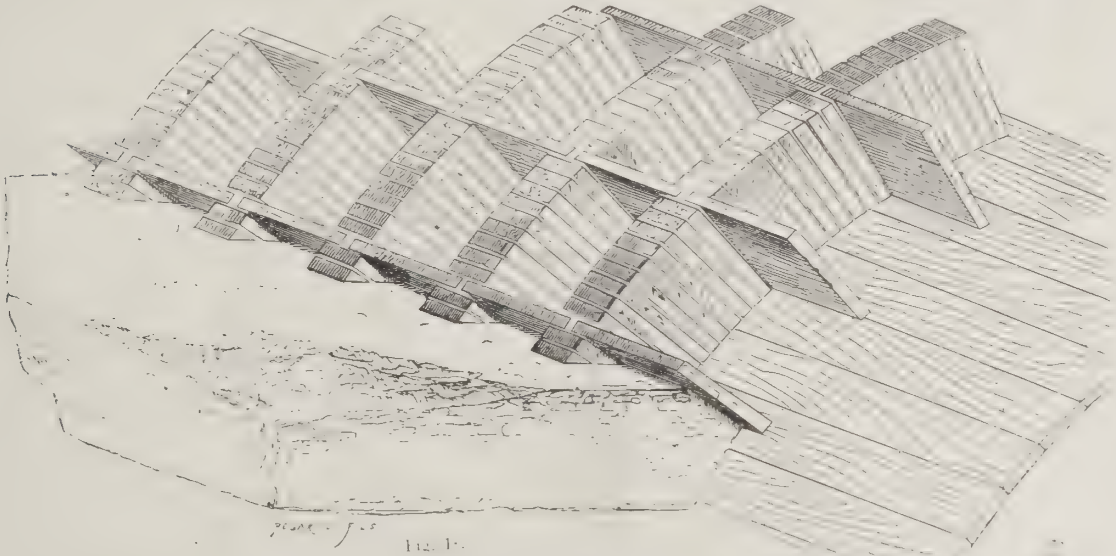


Fig. 18.

Sometimes, though this variation is very rare and is more probably the result of carelessness than of system, the larger bricks used for bracing, instead of following along the same generators of the vault, were so placed that they reached quite through the ribs they joined (Fig. 19), a doubly vicious arrangement, because not only was a larger number of bricks required to cover the same space as in the first arrangement, but it was also more difficult to properly place the filling on account of the narrowness of the cells. It is true that a greater stability was assured by the greater number of vaults, but as the other system gave quite sufficient stability for even the largest vaults, and as these armatures were essentially only auxiliary works, the Romans would seem to have been right in sacrificing this slight increase in strength for the more important considerations of lightness and economy.

The system, of which the first type is an example, was applied in a remarkable manner in the construction of one of the halls in the palace of the Cæsars at Rome, which is one of the group of buildings near the great circus. I have shown the vault in the first plate, and in order to make the general system of ribs more evident, and to show the relation with the supports, I have drawn a series of sections and arrachments which give all the details of the construction, and sum up all that I have so far said, both of the construction of vaults and of the general construction of Roman masonry. One can here see the analogy of construction between the rubble of the vaults and that of the piers, in the horizontality of the courses in both masses as well as the more noticeable analogy between the network on the intrados of the vault, and the revetment of triangular bricks which envelop the piers.

This plate shows what is perhaps the most perfect type of ancient armatures, for the network of bricks is at the same time a most rigid support and a continuous revetment. But this combination of merits necessitated an excessive number of bricks, and the Romans, sacrificing in the skeletons of their ordinary vaults these too dearly bought advantages, departed from this type little by little, and passed from a system of continuity to one of the most complete discontinuity, from the networks of bricks to the single engaged ribs. I will later endeavor to show the successive steps of these simplifications or variations. But in connecting the examples still to be cited with the preceding type, let it be borne in mind that I do not pretend to retrace the historic relation of the things themselves nor the progress of the different processes. The relative dates of the different vaults which we are to compare are ordinarily so doubtful that it would be foolhardy to pretend to know, at the present state of archæological knowledge, the true succession of the Roman methods. I will try only to show through the diversity of forms the dominant thought which decided the principal arrangement of the permanent centring of the ancient vaults.

If, bearing this in mind, one compares the vault in Plate I. with those in Plates II. and III. (drawn to the same scale), he will find that they are all connected by the same general principle, which has its completest expression in the vault of the Palatine.

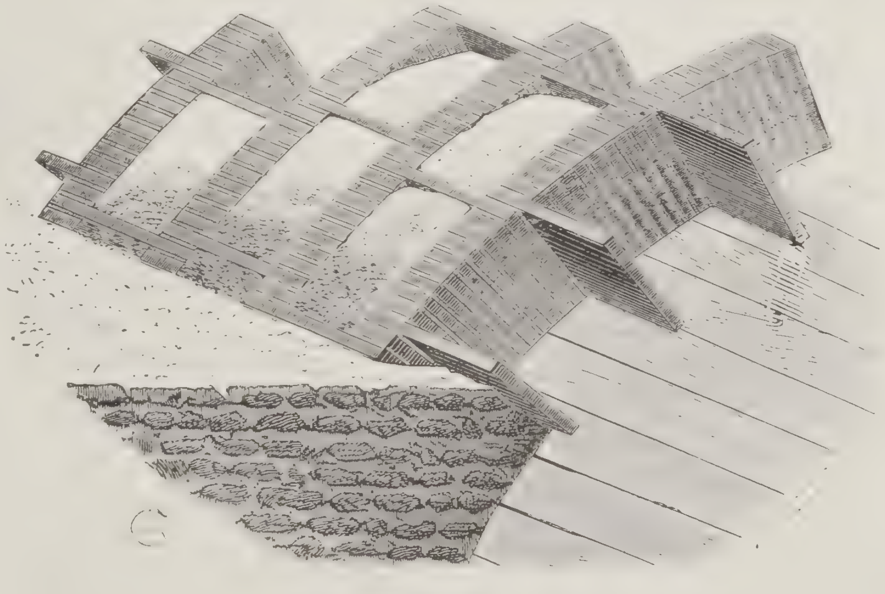


Fig. 19.

In the first figure of Plate II. the ribs are no longer directly joined together by the square bricks, and their contiguity alone is the only approach to continuity. The skeleton of the vault is reduced to a system of isolated ribs, fifteen centimetres in width, separated by a space too large to be spanned by means of bricks of the ordinary size. Therefore, the space between them is not divided into cells, but the bricks two feet square placed here and there in the ribs project from either side, making, as it were, headers in the rubble. Though not entirely dividing the interval between the ribs into cells, they form well-marked divisions, and almost make up for the inconveniences of the discontinuous armature. Each sustaining rib, cleared of the rubble, would have the appearance of Fig. 20. The wings, the projections of the greater bricks, catch, to a certain extent, in the masonry of the filling, and prevent its bearing on the centring, for it is evident that its adherence to the salient wings of the ribs would bring the greater part of the weight on to the armature, instead of allowing it to rest on the temporary scaffolding. This vault is characteristic of the first effort of the builders to free themselves from reliance on a complete network, and from the consequent expense, while still keeping the advantages of continuity. It is taken from the arcade of the aqueducts said to be that of Nero, of which the ruins are still to be seen built in the walls of the gardens along the street leading to the church of St. Stefano Rotunda in Rome.

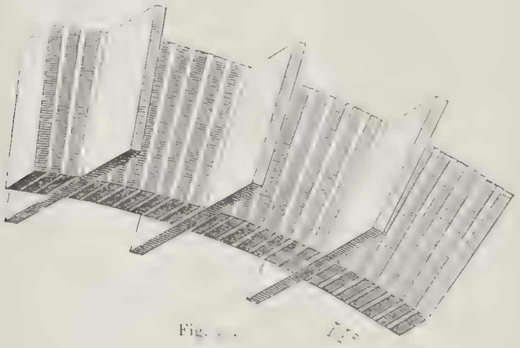


Fig. . .

The closest attention is necessary to perceive the arrangement shown in the figure; the rubble is of tiles of the same color as the armature, and the armature itself is so roughly built that it is needful to be aware of its existence in order to trace it through its envelope, whose tint adds to the difficulties of seeing it, which arise from its ruinous state and its rude construction. I said, in beginning, that it would be necessary to give, in the drawings, a regularity of construction to the supporting works which in reality does not exist, and nowhere am I more under the necessity of taking this liberty than here; but nowhere can one perceive better than in this aqueduct the importance the Romans attached to rapidity in building their armatures. I have given the reason for this haste and one cannot find it more clearly written than in the irregular forms of these arcades.

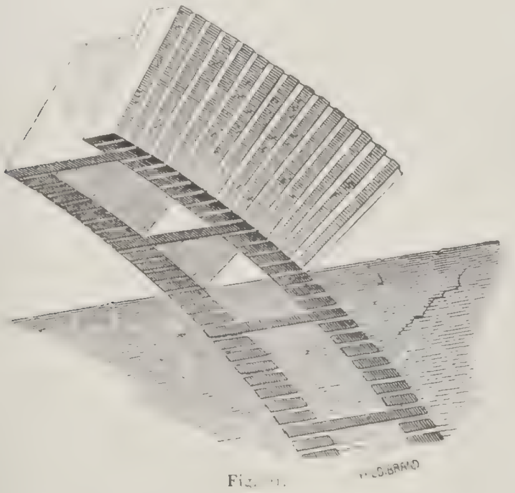


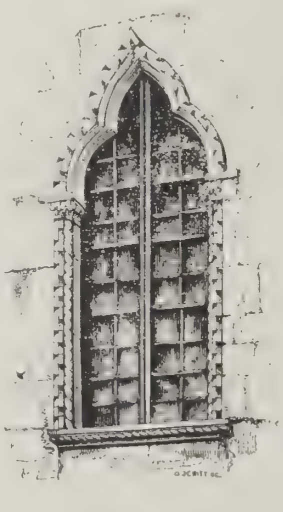
Fig. ·1.

The isolated ribs shown in Fig. 20 were easy to build, but from their slight thickness (about fifteen centimetres) were of an uncertain stability. They were subject to lateral deflexions or to twisting, and the Romans, to make up for the smallness of their section, replaced the arrangement of Fig. 20 by that of Fig. 21 where the arches are joined in pairs.

A rib thus formed of two coupled arches resembles a zone of the network of the Palatine. The superiority of this system over the preceding one is evident, the coupling of the arches increasing the whole width, and thus preventing the danger of deflexion; and it is to be found on a large scale in a great number of edifices, among which is the Coliseum. (Plate II., Fig. 2.)

The figure at the top of Plate II. shows a part of the exterior galleries of the Amphitheatre; two contiguous and parallel galleries of almost equal opening are shown. One only is built with an armature of bricks, the other being built directly on the centring, so that we cannot look on the mode of construction we are studying as a method systematically followed by the architects of the Coliseum; and, in truth, the Coliseum is, from a builder's point of view, a vast summing up of the art of building where every method known in ancient days was used: be it that the vaults have been reconstructed at different periods, be it that its original construction was undertaken by contractors to whom was given a certain amount of liberty in the choice of methods, it is still to be remarked that in different vaults, sometimes in different parts of the same vault, there are to be found most widely different ones. The barrel vaults seem generally to have been built on engaged ribs whose form and arrangement are sufficiently shown in the drawing; but there does not seem to have been any absolute rule either for the distribution nor for the construction of the ribs; sometimes they commence at the springing of the vaults, sometimes at a much higher level, sometimes their axes coincide with the architectural divisions, sometimes (as in Plate II.) the small arches carried on stone pilasters are placed eccentrically in regard to the skewbacks which take the thrusts. With but a little thought, the architects could have made the ribs a decorative feature of the vaults; but they preferred these incorrections to the risks attached to the otherwise slow building of these consolidating members, and trusted to a thick plastering, applied afterwards, for concealing the irregularities of structure. This negligence is common in the major part of the armatures which we will later take up; but before going further it will be better to analyze in a more exact manner the functions of the armatures we have just described.

(*To be continued.*)



THIS illustration was crowded out of the regular pages devoted to streets, "Brick and Marble," and is here inserted. It is referred to at the top of the second column on page 198.

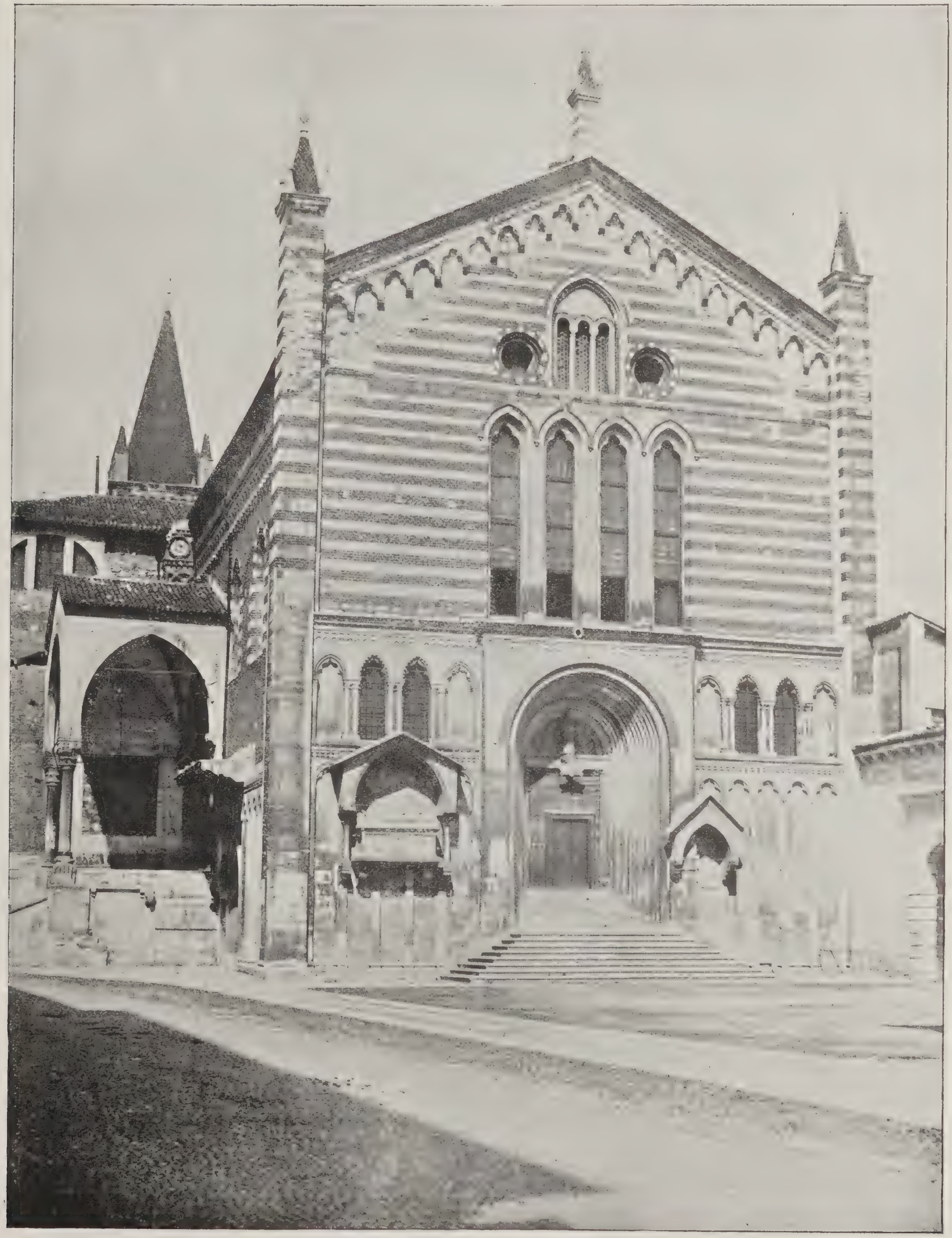
MR. A. H. BOWDITCH and Mr. J. E. Chandler have moved their architectural office to 85 Devonshire Street, Boston, the former from 131 Tremont Street, the latter from 9 Park Street.

MESSRS. WARREN & BACON will dissolve partnership, Mr. Warren continuing at his office, 9 Park Street, Boston.

MR. WM. Y. PETERS, architect, moves, November 1, from 13 School Street to 6 Beacon Street.

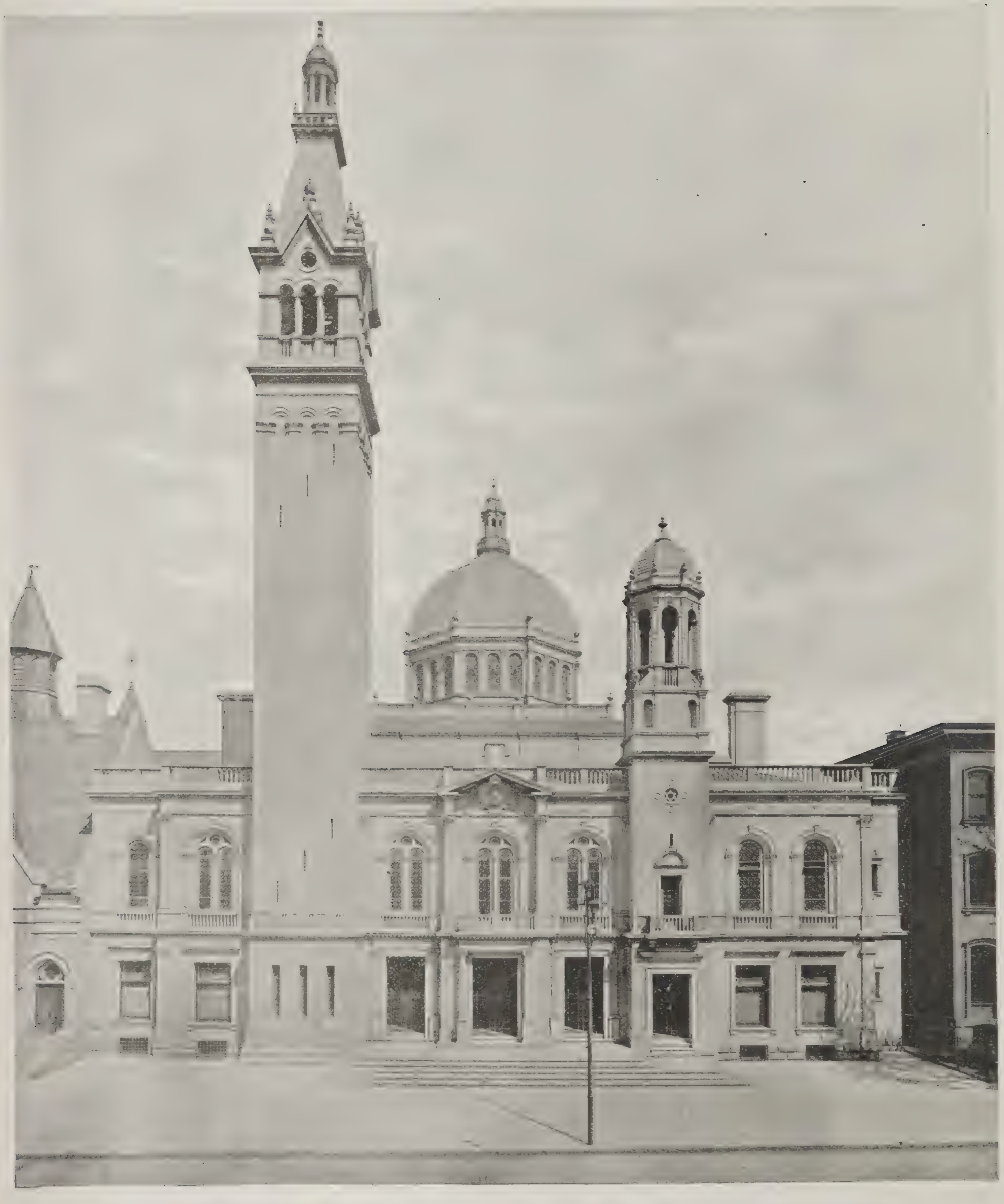
FR. VON EMPERGER, of 71 Broadway, New York, announces some tests of the Melan floor, of six and seven feet span. The samples will be manufactured at a yard on 19th Street and North River, before November 1, and the exact time of the tests may be obtained from Mr Von Emperger.

NOTE. — Plate I. was published in May, Plates II. III., and IV. in August.

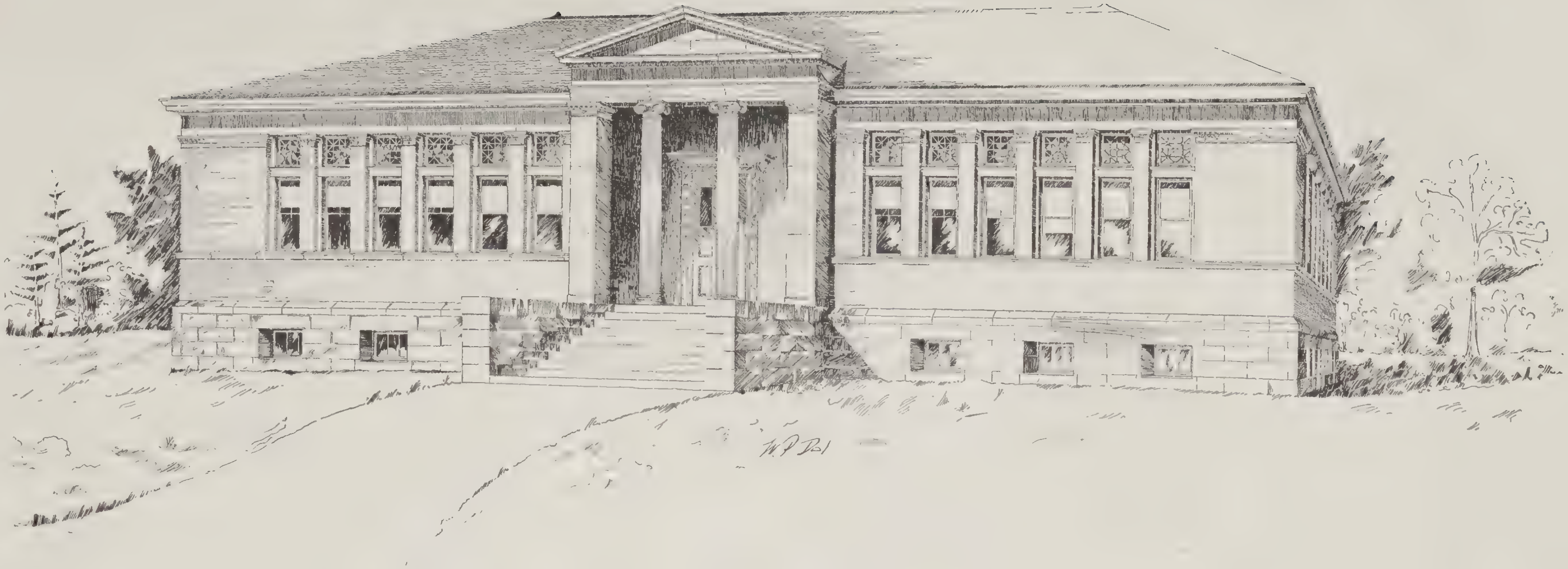


SAN FERMO MAGGIORE, VERONA.

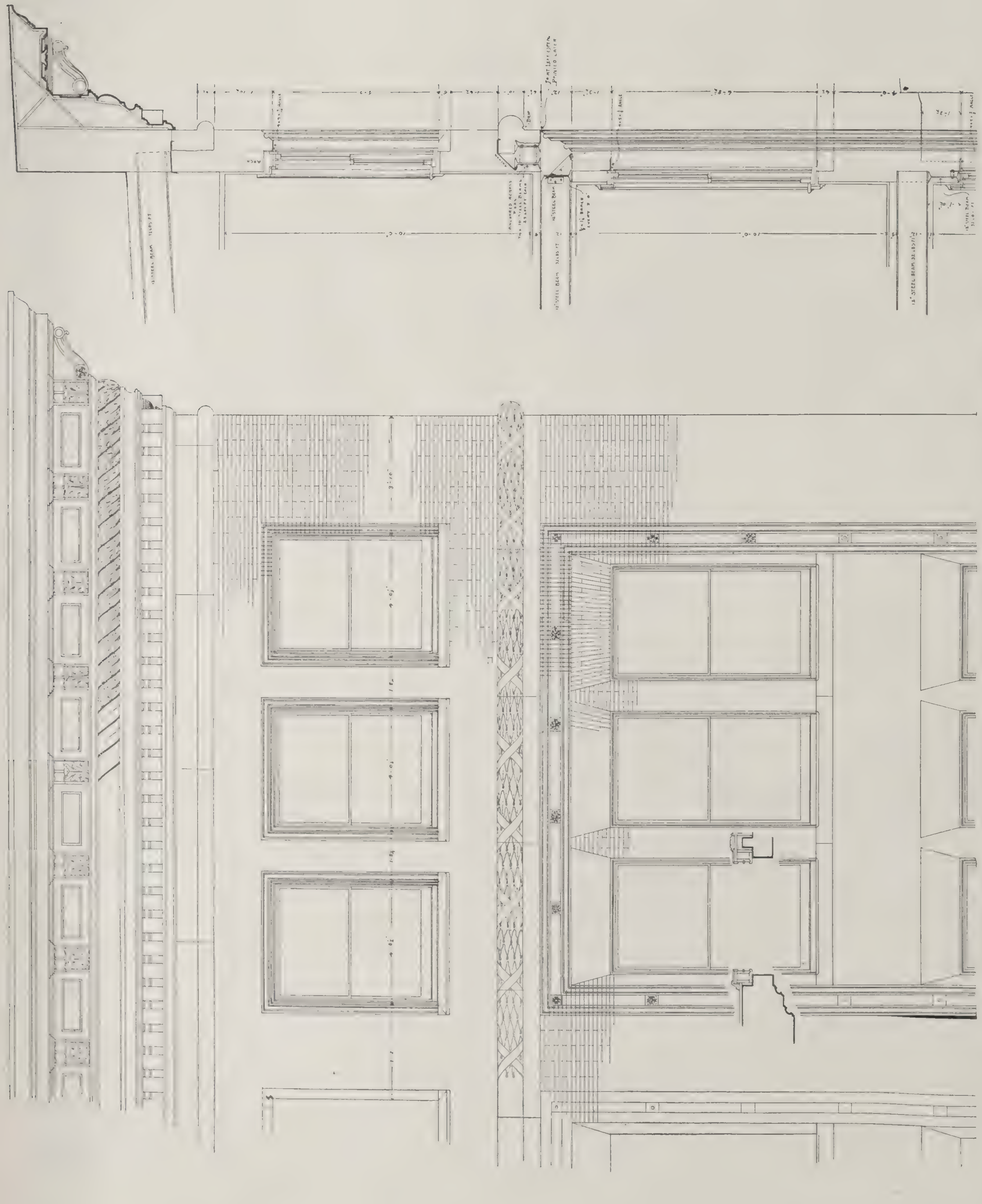
Supplementary Illustration to "Brick and Marble in the Middle Ages."



TEMPLE OF CONGREGATION KENESETH ISRAEL, BROAD ST. AND MONTGOMERY AVE., PHILADELPHIA.
Lewis Hickman, Architect, Brown Building, Philadelphia.
Built of Buff Brick made by the Eastern Hydraulic-Press Brick Company, Philadelphia.

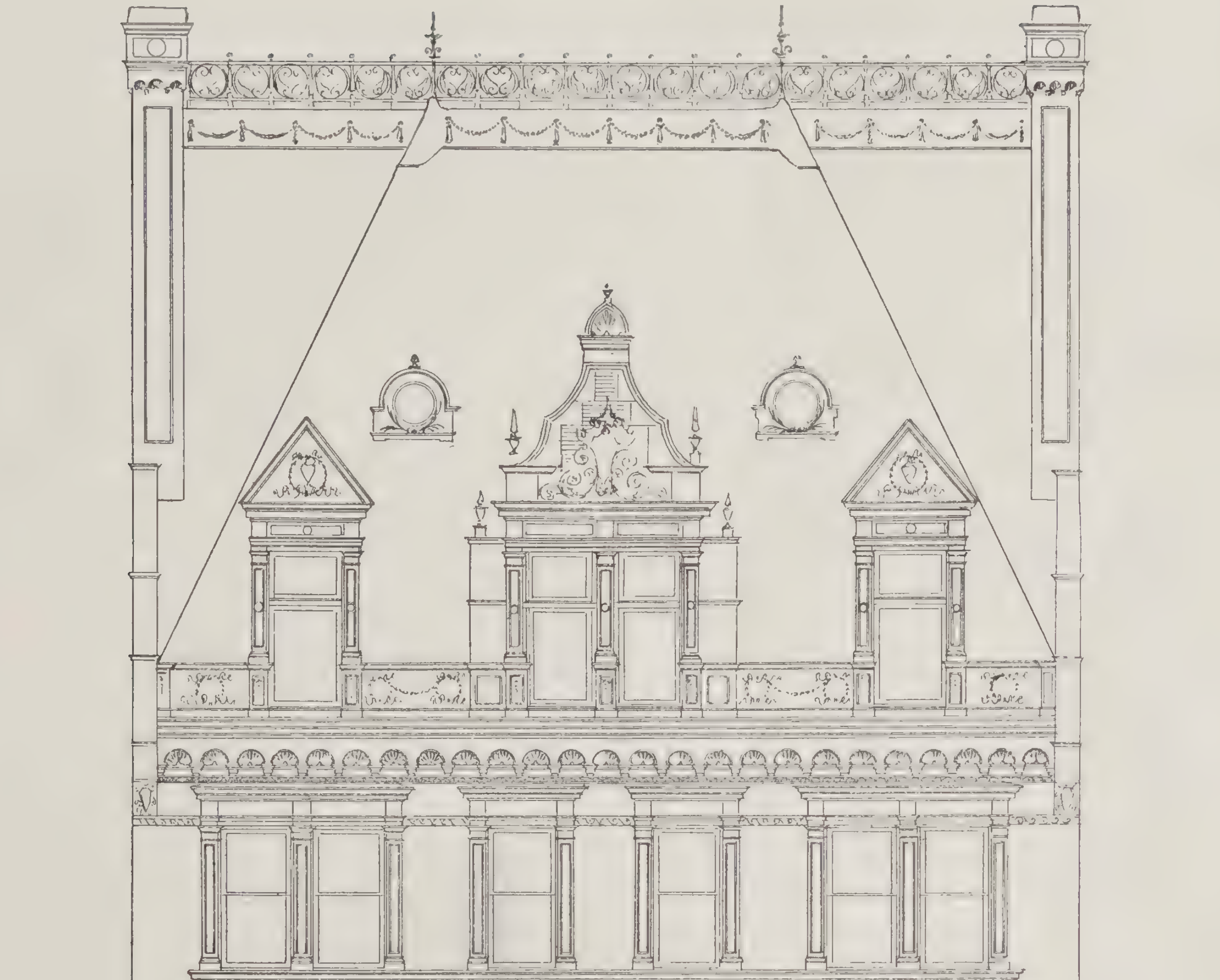


LIBRARY BUILDING FOR THE NEWTON THEOLOGICAL SEMINARY, NEWTON, MASS.
Kendall & Stevens, Architects, Boston.
English Buff Brick. Terra-Cotta by the New Jersey Terra-Cotta Company.

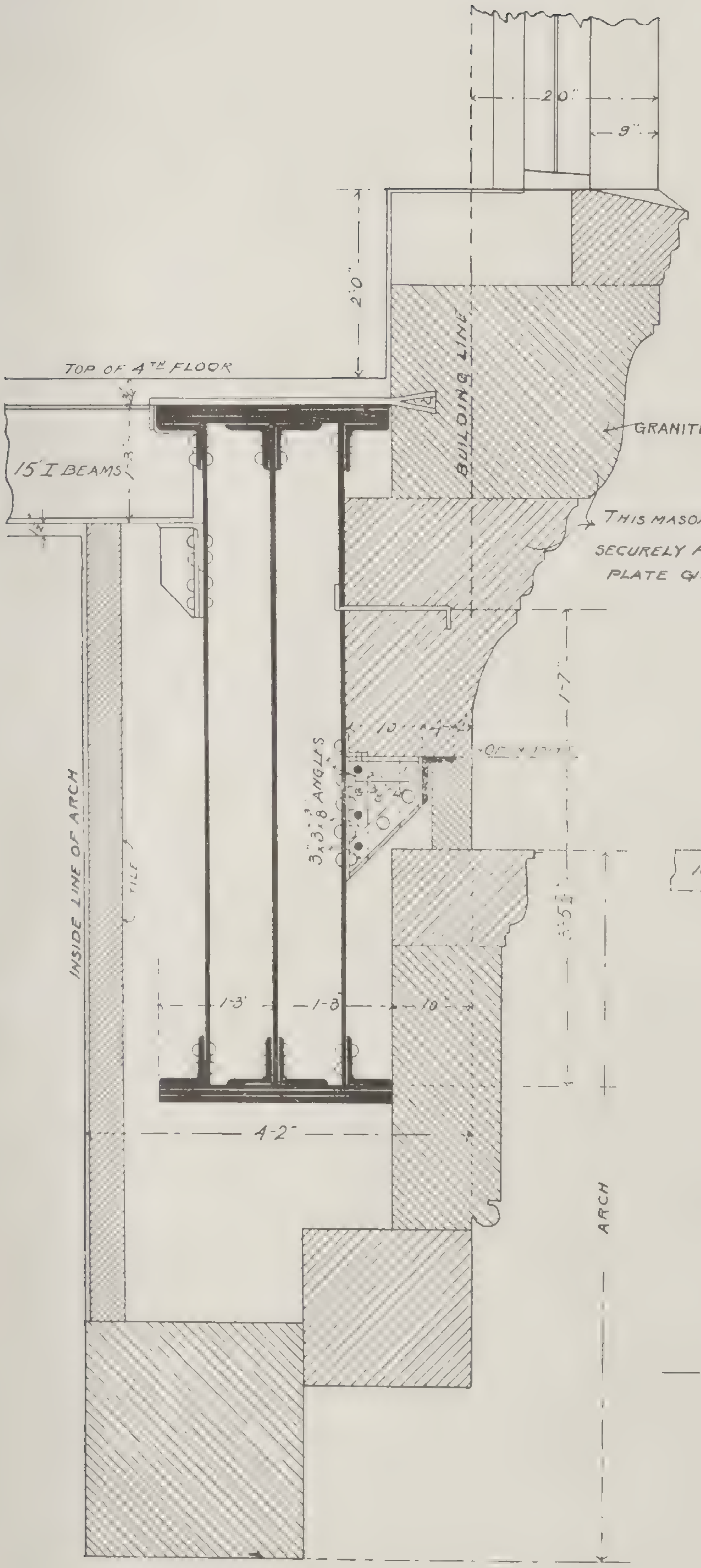


BANK BUILDING, PITTSFIELD, MASS. FRANCIS R. ALLEN, ARCHITECT, BOSTON.

DETAIL REDUCED TO ONE QUARTER INCH SCALE.

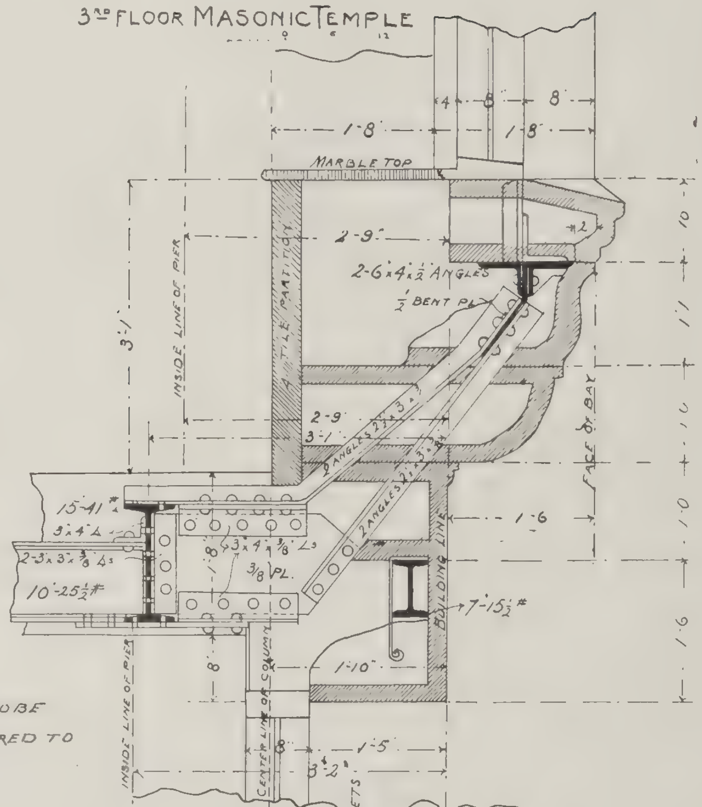


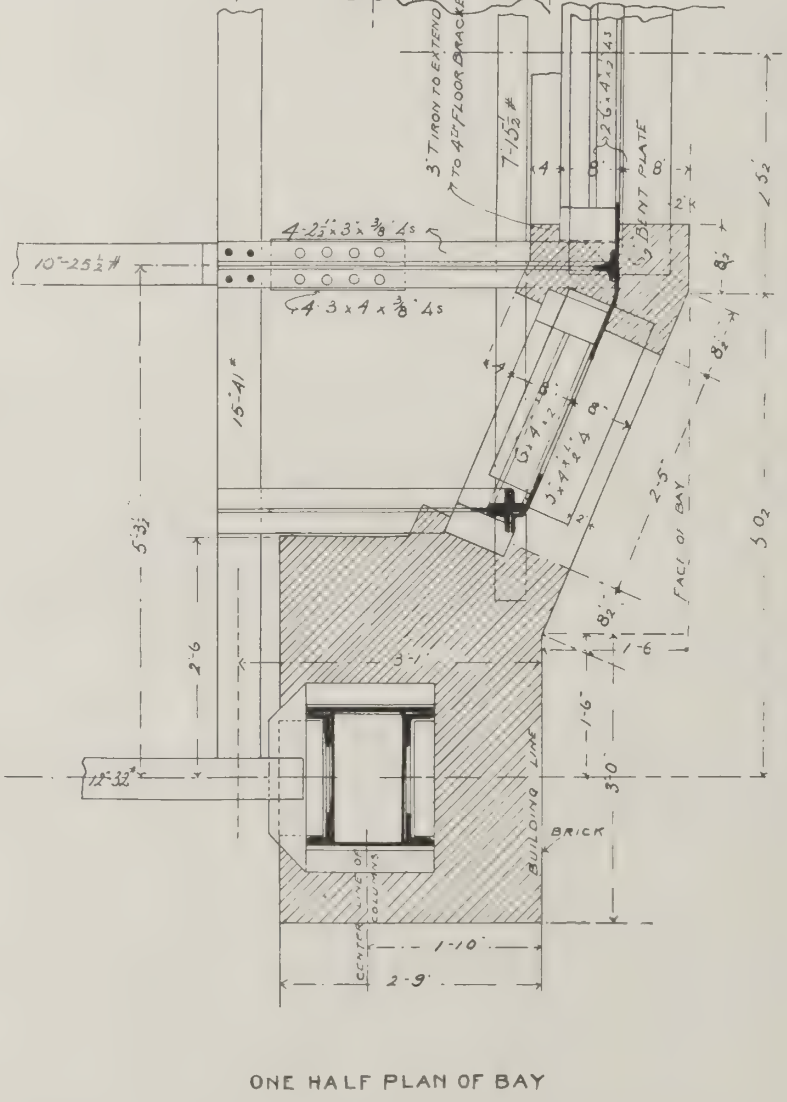
DESIGN SUBMITTED IN THE COMPETITION FOR A CITY HOUSE.
By J. G. Link, St. Louis.



SECTION OF GIRDER OVER
STATE STREET ENTRANCE
MASONIC TEMPLE
SCALE 0 6 12 IN.

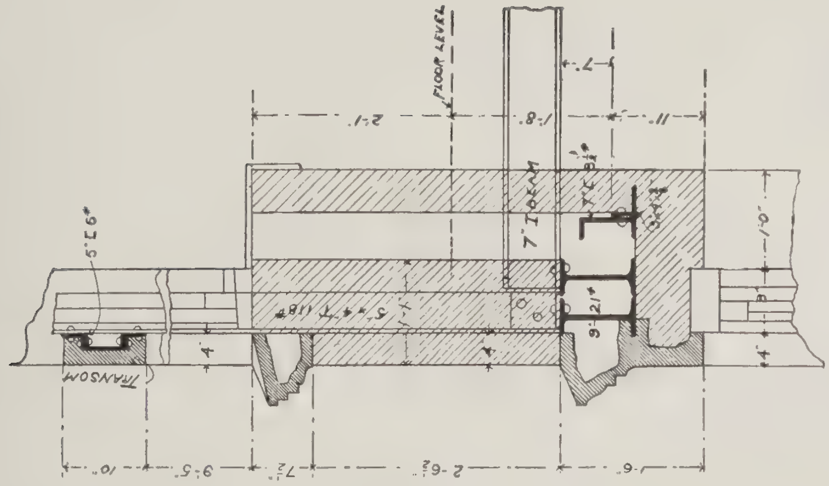
SECTION THROUGH BAYS
3RD FLOOR MASONIC TEMPLE





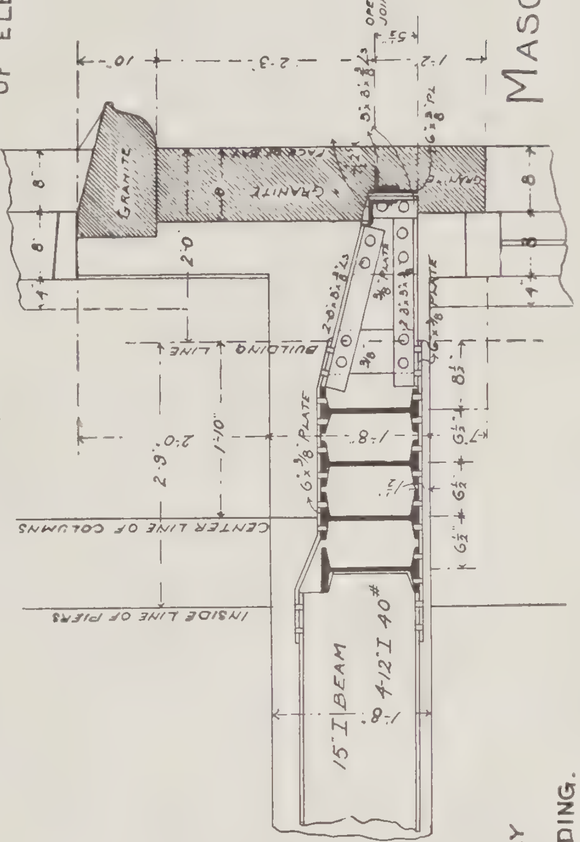
ONE HALF PLAN OF BAY
3RD FLOOR MASONIC TEMPLE
SCALE 0 6 12 IN.

DETAILS OF FIREPROOF CONSTRUCTION.

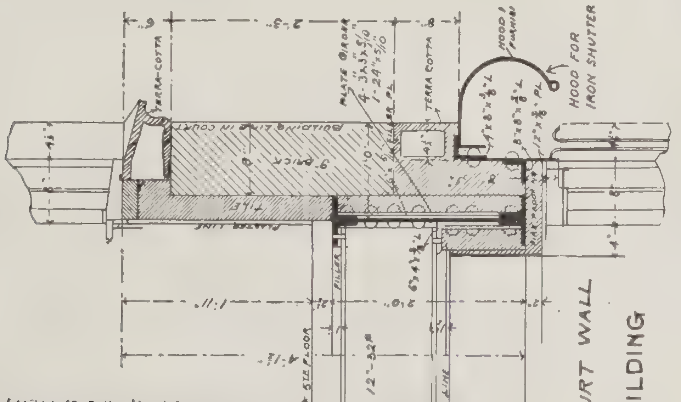


SECTION THROUGH WALL BACK OF ELEVATORS.

MASONIC TEMPLE.

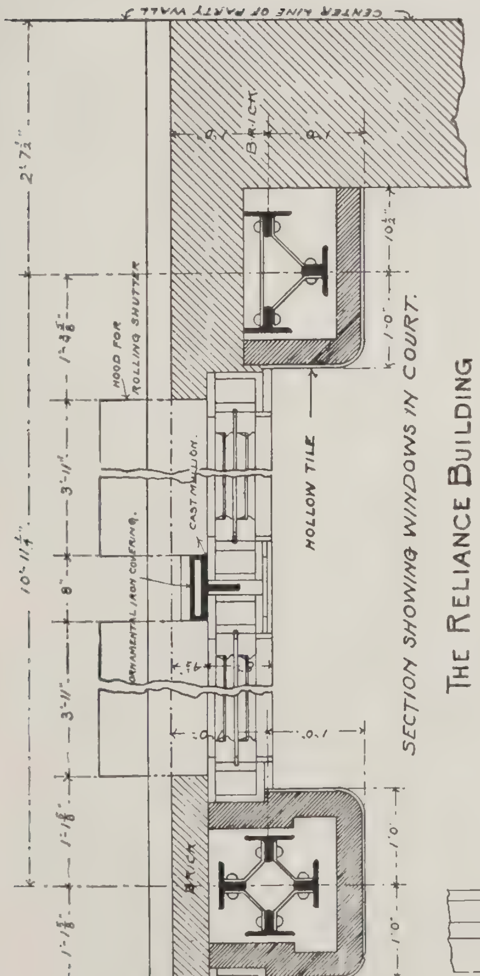


SECTION THROUGH CENTER BAY 4TH FLOOR



SECTION THROUGH COURT WALL

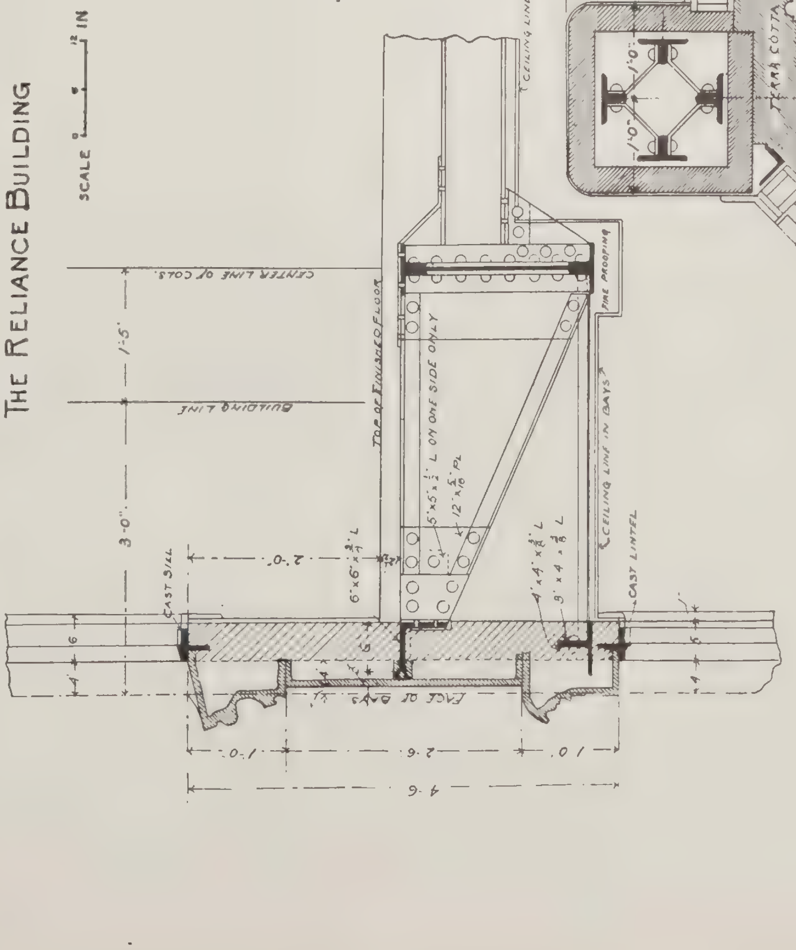
THE RELIANCE BUILDING



SECTION SHOWING WINDOWS IN COURT.

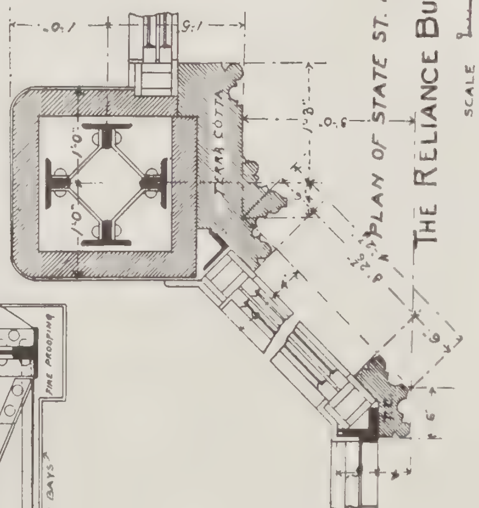
THE RELIANCE BUILDING

SCALE 0 6 12 IN



SECTION OF BRACKET THRO STATE ST. BAY

THE RELIANCE BUILDING

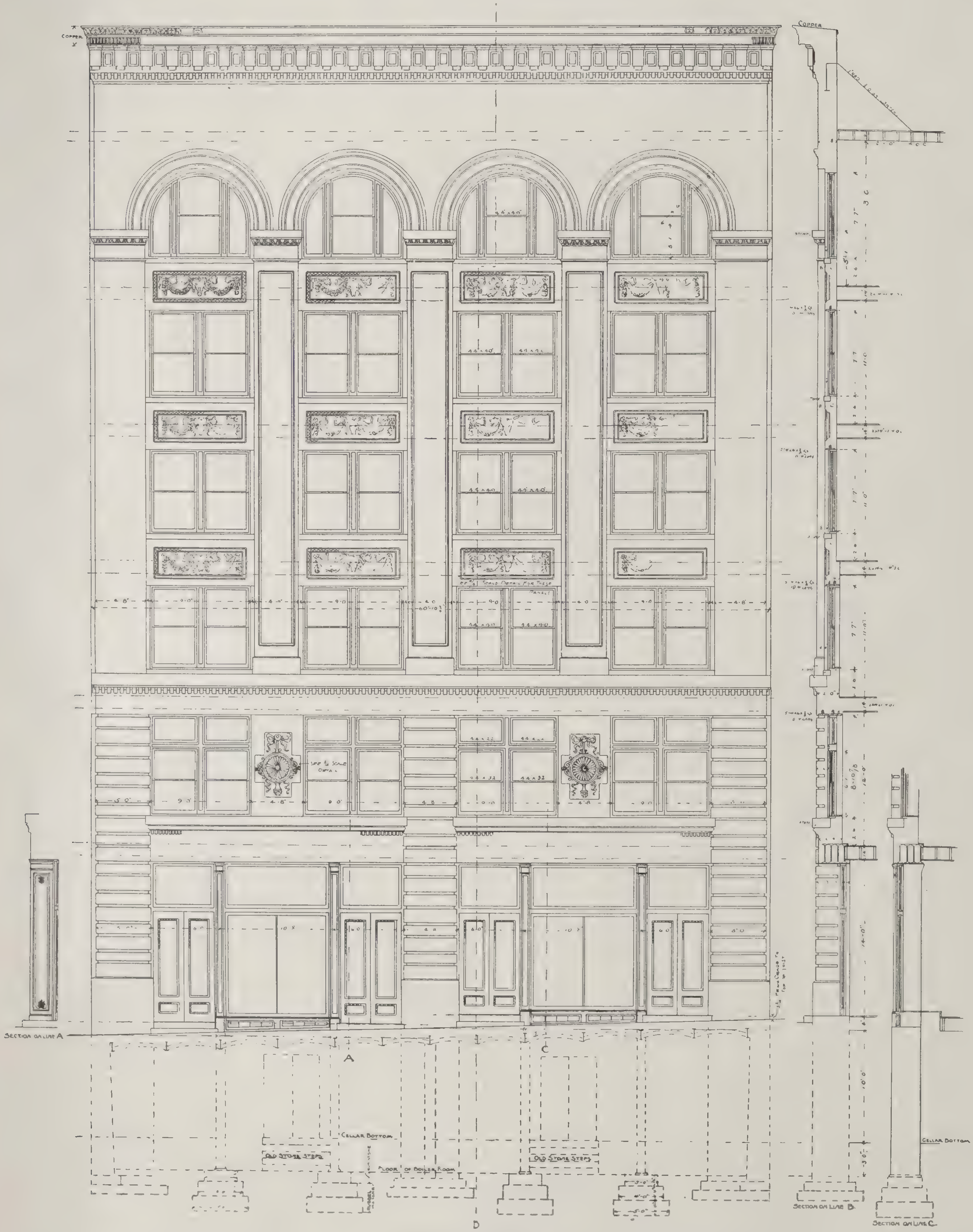


PLAN OF STATE ST BAY

THE RELIANCE BUILDING.

SCALE 0 6 12 IN

DETAILS OF FIREPROOF CONSTRUCTION.



GOLDWATER BROS.

FRONT ELEVATION
SCALE 1/4" = 1'-0"

BLACK & MEYER.
NOLAN, NOLAN & STERN,
ARCHITECTS

STORE BUILDING, ROCHESTER, N. Y.

THE BRICKBUILDER.

AN ILLUSTRATED MONTHLY DEVOTED TO THE ADVANCEMENT OF ARCHITECTURE IN MATERIALS OF CLAY.

PUBLISHED BY

The Brickbuilder Publishing Company,

CUSHING BUILDING, 85 WATER STREET, BOSTON.
P. O. BOX, 3282.

Subscription price, mailed flat to subscribers in the United States and Canada	$2.50 per year
Single numbers	25 cents
To countries in the Postal Union	$3.00 per year

COPYRIGHT, 1893, BY THE BRICKBUILDER PUBLISHING COMPANY.

Entered at the Boston, Mass., Post Office as Second Class Mail Matter, March 12, 1892.

THE BRICKBUILDER is for sale by all Newsdealers in the United States and Canada. Trade Supplied by the American News Co. and its branches.

PUBLISHERS' STATEMENT.

No person, firm, or corporation, interested directly or indirectly in the production or sale of building materials of any sort, has any connections, editorial or proprietary, with this publication.

WE publish above a panel of white terra-cotta in the residence of Col. Wm. E. Rice at Albany, of which Richard Howland Hunt of New York is the architect. The work was executed by the Excelsior Terra-Cotta Co. of New York.

A FUND of two hundred pounds is being raised by the Royal Institute of British Architects for a series of systematic tests of brickwork, and this has brought out a number of descriptions of isolated tests made at various times and places, the last of which is particularly interesting, although it bears not so much on the crushing as the tensile strength of good brickwork.

The work in question was a part of the Albert Warehouses at Liverpool, and was of about fifty years' standing, consisting of hand-made bricks set with ground mortar of Halkyn Mountain lime, which is in a high degree hydraulic.

The brickwork was cut out, top and bottom, twelve feet wide, leaving a lintel seven courses deep (about two feet, the English brick being much larger than our standard size) and two feet wide, the ends being left in the wall. It was heavily loaded with no sign of defection. First two courses, and then one, were cut off, in order, and the ends cut out leaving a twelve-inch bearing on the original mortar bed.

The brick beam then measured four courses in depth, or about fourteen inches, the lower course being stretchers, the next headers, the third stretchers, and the fourth headers. A centre load of 9,500 pounds was placed on it and left several days with no apparent effect. This load was then increased to 12,923 pounds and was carried about thirty hours, when it suddenly broke, there being three fractures about eighteen inches apart in the middle of the lintel.

It is seldom that brickwork is submitted to such conditions, and the test is of value only as showing how homogeneous good brickwork may be made. An evenly distributed load would have made a more useful test, as indicating how near self-sustaining a wall over an iron or steel beam may be made. The old bricks in this wall could not be cleaned by simply tumbling the wall over and letting the shock shake the mortar loose.

TERRA-COTTA SPANDREL, AMERICAN THEATRE, NEW YORK.
C. C. HAIGHT, ARCHITECT.
NEW YORK ARCHITECTURAL TERRA-COTTA CO., MAKERS.

THERE still clings to a large portion of the Boston profession a deep-rooted prejudice against a dry-press brick. This is to a large extent unjust. Because once *all* brick made by this process may have been unfit for use, and now *some* brick are still bad, it does not follow that *all* dry-press brick are bad. There have been steady advances in the dry-press process which architects outside of Boston, and fully as capable of judging, take into consideration. St. Louis, the brick city of the United States, is largely built of dry-press brick; Chicago, Milwaukee, St. Paul, all with more trying climates than Boston, have many of their finest buildings of dry-press brick. Here is the mud brick stronghold; and while we are not championing dry-press methods in particular, we would suggest to the architects of Boston, many of whom can't now and never will be able to tell the difference between a mud and a dry-press brick, that there must be some enduring quality to entice so many hundreds of thousands of dollars, so much hard-headed business ability, so much mechanical genius, as we find enlisted in the dry-press brick industry. Look at our back cover, and at pages xiv and xx. Are such ponderous and at the same time delicately adjusted machines built for a song? Is there no study, no inventive genius, displayed in their mechanism? Could manufacturers afford to invest the capital necessary to bring out these machines, if the wares they produced were unfit for use? Then, too, take the dry-press brick makers themselves; are the men, for instance, who have the management of the enormous interests of the ten Hydraulic-Press brick companies of a visionary type? Can any one who knows Mr. Ittner imagine him chasing a will-o'-the-wisp? Are not these men (and a hundred others we could name), with their long experience in manipulating clays, with their opportunities to test brick, and with an interest in how their brick in one job, their competitors in another, are standing the test of time, an interest that is keen and lively, long after the architect himself has forgotten whether he used wood, brick, or stone, — are not these men, we ask, fully as capable of deciding on the value of a process of manufacturing as the architect who, comparatively, knows nothing whatever about it?

"ANENT the foregoing there is a tale," which is all the better because it is true.

A certain hustling salesman for a building materials house — the *one* that pastes paper labels on sample bricks — was preparing some samples to take to a prominent architect in New England. He knew this architect was down on dry-press brick and took, or thought he took, rather particular pains to fix up some very fine specimens of mud brick. The display room of the building materials house in question contains a large line of all shapes, colors, and kinds of brick, and in some way a dry-press brick got a mud-brick label, bearing the name of a firm known all over the country for their fine quality of mud brick. Our friend the salesman did not discover the mistake until later, when the architect had the brick in his hand and was remarking on its good quality. Then, with many apologies, he explained the mistake, and, *presto*, that brick lost all the good quality that the wrong label had made so apparent. As we said, this is true, and we would say to readers who may doubt it that, so far as the job is concerned, you are "warmer," as children playing hide and seek say, than you may imagine. While we do not say this was a Boston architect, he might as well have been. However, there are architects and architects, and, even in Boston, all are not indiscriminately condemning dry-press brick.

WITH this number, Chapter VI. of "Brick and Marble in the Middle Ages," begun in June, comes to an end. The whole chapter has been devoted to Verona, and twenty-eight illustrations have been given. Thirteen of these have been supplementary, being reproduced from photographs, six being full-page size. Previous to Chapter VI., there were twenty-two illustrations. The finest part of the work is yet to come, and we have in hand a large collection of the best photographs, with which to illustrate the text most fully. We would particularly call the attention of intending subscribers to the cities to be described and illustrated, of which we can only mention a few: Vicenza, Padua, Venice, Mantua, Cremona, Lodi, Pavia, Milan, Ferrara, Bologna, Modena, Parma, Piacenza, Asti, Monza, Como. There are in the original work eighty-seven illustrations remaining. To these we shall add from forty to fifty from photographs. This feature is alone enough to repay for subscribing, and we would urge placing an order to begin with the November number, when a new chapter will start. The interest this work has aroused has resulted in a demand for back numbers that has completely cleared our stock out, making it impossible to date subscriptions back any longer.

Starting with eleven illustrations in our January issue of this year, we have steadily increased the number, and not only that, but we have improved the average quality by more careful selection. Our last issue contained thirty-seven illustrations. Even should we not continue to increase the size of our paper and the number of illustrations, subscribers can count on this as an average; we do not propose to go backward, and we have no intention of standing still. Allowing for a very moderate increase, our illustrations for 1895 will number five hundred, and with original ariticles, correspondence from leading cities, a most valuable series of papers on fireproofing and on concrete construction, to round the volume out, it should be well worth our moderate subscription price.

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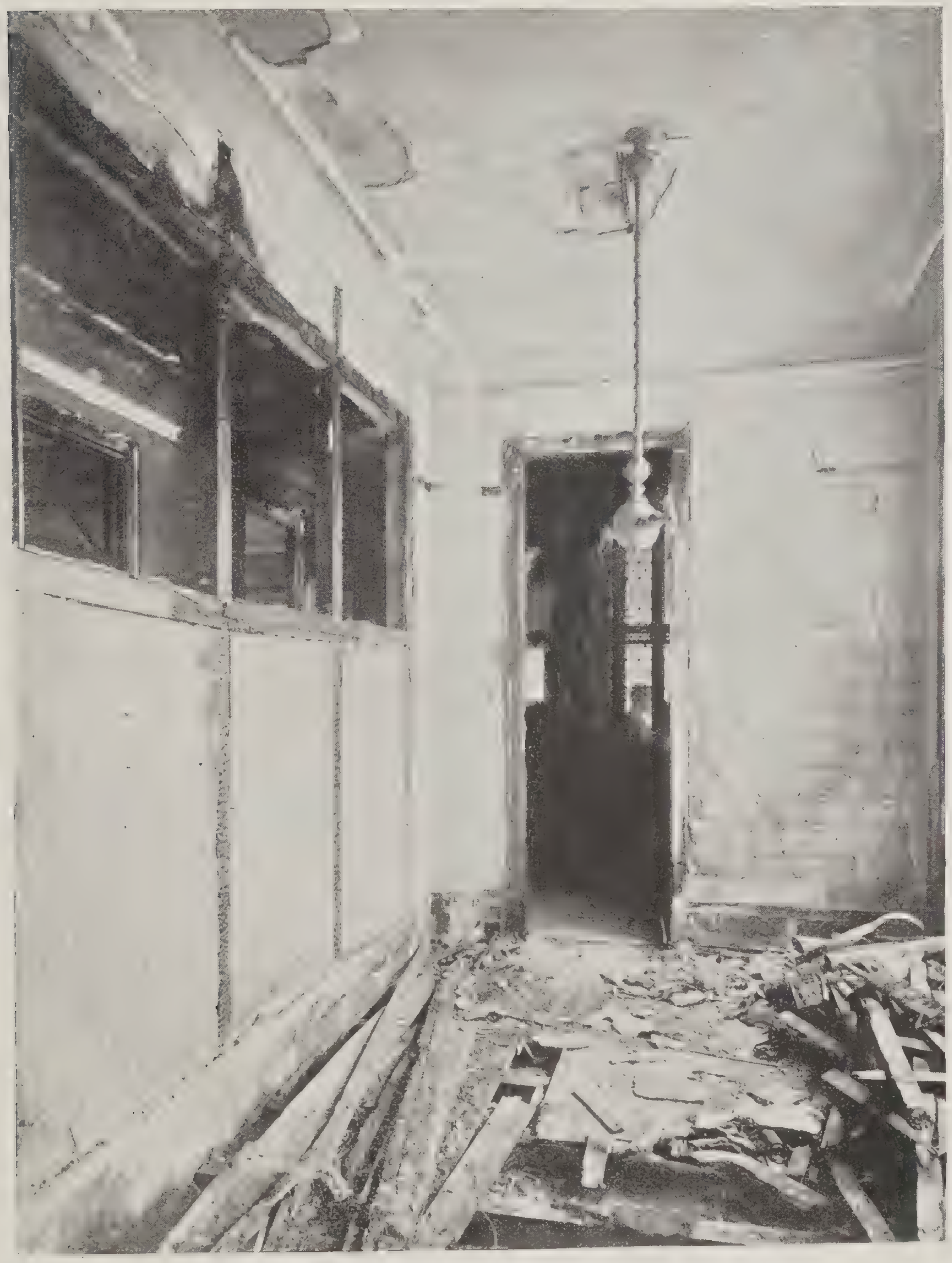
FIRE IN MACINTYRE BUILDING.

ON Sunday afternoon, June 17, a fire occurred in the eighth floor of the MacIntyre Building, No. 874 Broadway, corner of 18th Street, New York. This building is constructed with a steel skeleton frame and steel beams filled in with hollow tile flat arches and hollow tile partitions manufactured by the Raritan Hollow and Porous Brick Company. The fire originated in the studio of Mr. R. Bier on the eighth floor directly opposite the offices of the Raritan Hollow and Porous Brick Company.



VIEW IN STUDIO, MACINTYRE BUILDING, NEW YORK.

Mr. Bier was engaged in cleaning some upholstered furniture and draperies with benzine in order to destroy moths; and after he had cleaned two or three chairs and saturated them pretty thoroughly with benzine, there was a sudden explosion and the fire seemed to jump from one article of furniture to another, and also communicated with the varnished woodwork of the doors and windows. The spread of the flames was so rapid that Mr. Bier was not able to open the door and attempted to get out of the window, but failed in this also. He was finally obliged to jump through the glass panel in the door.

He was very severely burned and cut, but rushed immediately down-stairs to the telephone office which is on the fourth floor, and from there an alarm of fire was sent out. By the time the firemen reached the building the room was a mass of flames, completely destroying everything in it. The fire was so hot that the iron steam pipes were melted and bent.

The studio had two doors and two windows opening into the hall. The fire spread through these and into the opposite rooms, the woodwork and doors of which were ignited.

The fire was put out before any serious damage was done to any of the offices except in the studio in which it originated, and in this room there was no injury done to the building itself except the woodwork and the plastering. The hollow tile ceiling and partitions were not injured in any way, and it merely required a new coat of plaster and new trim and wooden floor to put the office in complete order.

This fire clearly shows the great value of burned clay fireproof construction, the whole principle of which is to confine a fire to the room in which it originated.

Had such a fire occurred in a building of ordinary construction, the entire building would probably have been destroyed.

If this fire had occurred on a week-day when the employees of the building were about, it probably could have been put out with the fire hose with which the building is equipped, but having occurred on Sunday nothing was done until the firemen arrived, and it of course took them some time to get their hose up to the eighth floor. As it was they had the fire out inside of half an hour.

The photographs which were taken the following morning clearly show the effects of the fire on the tile partitions and ceiling, and also the condition of the room and hallways after the *débris* had been partially cleared up.

TERRA-COTTA IN SKELETON CONSTRUCTION.

(*Continued.*)

THE reader is referred to the article under above heading in preceding issues. Details are presented this month of the Chicago "Masonic Temple" and "Reliance" buildings, for the use of which thankful acknowledgment is made to Messrs. D. H. Burnham & Co., also a section through one of the numerous bays which form the front of the "Tacoma" building, — one of the pioneer office buildings, — for which we are indebted to Messrs. Holabird & Roche, the architects. In the "Tacoma" cast-iron columns and cast-iron lintels were

VIEW IN HALLWAY, MACINTYRE BUILDING, NEW YORK.

used. The mullions are special pressed brick, and the whole street fronts are thin shells of pressed brick and terra-cotta. Wind bracing was taken care of by means of heavy internal brick cross walls.

The "Reliance" building is under construction at the present time. The new "Gray" column was adopted for this structure. The chief claims made in favor of the "Gray" column seem to be, simplicity of construction, ease of designing connections, and consequent economy in time and expense of preparing shop drawings, continuous pipe space inside the columns, and economy of steel.

D. EVERETT WAID.

EDITOR OF THE BRICKBUILDER:

Sir, — In your issue of September I note an article upon Fireproofing City Houses, containing a comparative schedule of the fireproof and the non-fireproof structures, also a criticism, by Mr. Blackall, on Mr. Manley N. Cutter's original paper.

With pleasure I yield to Mr. Blackall as an architect, but I beg the privilege of disagreeing with him on some of his estimates of fireproofing. To say that it is most desirable in all cases to build fireproof is needless, as all thinking people concede this, the only impediment to such a universal result being the cost. It appears that there is no question but that the Chicago skeleton construction for large buildings is the cheapest, lightest, and best. For smaller buildings this perhaps is yet to be determined. As to party or partition walls, the building laws require solid brick walls, so that in this respect steel support and girders are apparently an extra expense. For outside walls, four-inch work is, as Mr. Blackall says, entirely too thin, and no method is provided for bonding, or tying the same to make it secure; but with a single course of brick outside, and a six-inch partition block inside, it would be possible to have a bond at regular intervals, which would insure security, and this block would cost eighteen cents per square foot laid and ready for plaster, the whole independent of iron. Mr. Blackall figures brickwork at thirty cents per square foot, and with iron at forty-two cents, which is eight cents less than the cost of a sixteen-inch wall at his figure of fifty cents per square foot, and only four and one half cents more per square foot than for a twelve-inch wall. Now to this item of thirty-seven and one half cents per square foot for twelve-inch work, or fifty cents for a sixteen-inch wall, it seems evident some addition must be made for plastering, this apparently having been omitted. It would not seem wise to apply the mortar directly to the outside wall, unless the same were either furred and lathed, or vaulted, as no way has been provided to prevent the dampness from penetrating the wall, — quite an essential consideration. The expense of vaulting need not be computed, as it appears sufficiently positive that it would greatly increase the difference shown between the two methods, to say nothing of the loss of room used in this construction.

To fur and lath the cost would be, for furring, three inches wide, twelve inches on centres, at $20 per thousand feet, including spikes, one half cent per foot; for labor in applying same, at $2.50 per square of one hundred square feet, two and one half cents per foot; and for wire lath three cents per square foot, which is the cost for suspended ceiling, making a total of six cents per square foot; which would bring the cost of the twelve-inch wall up to forty-three and one half cents, and of the sixteen-inch wall up to fifty-six cents, ready to plaster, thus giving the benefit in both cases to the new methods, and in neither case is the five-inch or nine-inch loss of room calculated, or the expense of land for same or the interest.

Again, taking the figures for floors, as given for iron work, concrete, and suspended ceiling at forty-three cents per foot, we find numerous items missing. In the cost of the timbered floor no labor has been provided for putting the flooring in position and framing same, furring the ceiling for lathing, or the wire lath for same. This would cost for labor, framing, and putting the floors in position, $5 per square, or five cents per foot; furring and labor, as before estimated, three cents; and wire lathing at three cents per square foot as for suspended ceiling, a total of eleven cents, to which add the four cents, as given for flooring, bringing the cost up to fifteen cents per square foot. Here is fully twenty-five per cent addition to the difference between the old and new methods, really giving a fireproof building, in the matter of walls and floors, for an additional expense of twenty-eight cents per square foot over that of an inflammable structure.

While in this we have diverged slightly from the lines laid down in the comparison of Mr. Blackall's and Mr. Cutter's methods of exterior walls, we have added to the expense of the terra-cotta blocks, making the same six inches instead of four inches, but the additional expense of the wire lath is in this method dispensed with, and a strong, stable, and secure wall is produced without the aid of any foreign auxiliary strengthener, that appears by its separating the different courses of brick to take from the strength by effectually preventing a tie, except from the mortar.

We heartily concur with Mr. Blackall "that this is an attempt in the right direction," but many suggestions may be made to get a far better result and at the same time diminish the cost considerably. For instance, an eight-inch flat terra-cotta arch could be used at no additional expense, and save the three cents per foot for wire lath, bringing the difference to twenty-five cents per square foot over that of the common combustible method.

In both these articles it will be remarked that no notice is taken of any differences other than cost, while the many advantages not directly pertaining to expense are totally ignored; as, for instance, deafening, drafts, vermin, temperature, durability, strength, insurance, etc. We hope some one will show the money-saving advantage of fireproof construction, and eliminate this money difference, which really does not exist when dollars and cents are placed opposite each advantage, in comparison with the old methods.

H. H. FERNALD.

BOSTON, Oct. 10, 1894.

For the details of Fireproof Construction see Plates 78 and 79.

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A REVIEW OF VARIOUS METHODS OF CONCRETE CONSTRUCTION AS APPLIED IN ENGINEERING WORKS.

CONCRETE IN FOUNDATIONS.

CONCRETE has shown itself to be so satisfactory for foundations of all kinds, that it has come to displace, almost wholly, all other building material in this department of construction. In submarine works it is indispensable. In wet localities, in newly made ground, under tide water, on marshy and springy earth, it forms the best of footings, and when combined with steel, it has become wellnigh indispensable for distributing heavy concentrated loads over large areas, as in the great Chicago buildings. Its massiveness, strength, imperviousness, and ease of manipulation have made it deservedly popular in heavy masonry construction of all kinds.

For moderate loads, say for a five or six story brick tenement, a very substantial footing is formed by laying a mass of concrete in rough wooden moulds. The base should be about three feet wide, although this depends wholly on the nature of the soil upon which the building rests. The thickness should not be less than two and one half feet, if the soil is at all springy. The sides should be sloped up at an angle of about 60°. Such a foundation is suitable on newly made ground that is springy and constantly wet by tide water. It is better than piling, for the reason that it gives a more uniform settlement, is free from shocks and the consequent danger to neighboring property, and besides is less expensive.

The concrete should be made in the proportion of about one barrel of high-grade Portland cement to a yard of aggregates. Large stone, of angular fracture, broken to pass a two-inch ring, should be used with a liberal quantity of coarse, sharp, gravelly sand. It should be borne in mind that about one half of a cubic yard of gravelly sand may be mixed with a yard of coarse stone, without increasing the bulk of the stone. By aggregates, is meant a mixture of stone and sand in such proportions as to fill all the voids and make a compact mass.

The concrete should be thoroughly mixed, and wet sufficiently to bring it to a stiff viscous condition. The moulds should be formed of rough spruce stock, rigidly braced, so as not to vibrate when the tamping is being done. The concrete should be put in in layers of about six inches thickness, and well tamped, and layer should follow layer until the mould is filled. Such a foundation forms a solid monolithic block of great strength and stiffness, and the ease and rapidity with which it may be constructed are great points in its favor.

For heavier loads, and in those localities where the supporting soil is poor and uncertain, it is often advisable to increase the rigidity of the concrete by the use of iron. In the great Chicago buildings, where the soil supports barely one and one half tons to the foot, these iron and concrete foundations are constructed on a very large scale. Layers of large rolled beams imbedded in concrete are laid one upon the other crossways, and in this way a great concentrated load is distributed over a large area. The object of the steel beams is to give sufficient stiffness and resistance to bending to the concrete to enable it to distribute its load.

In place of the rolled beams, a method has been largely used which gives the same results at a great saving in cost. This is accomplished by using rods of twisted steel, and imbedding them in the concrete in such a way that if there is any unequal settlement of the soil the iron will prevent any bending and consequent cracking of the foundation.

In an article by Mr. F. E. Kidder, the well-known author of the "Architect's Handbook," published in *Architecture and Building*, a description of these twisted steel foundations is given, and is interesting reading: —

"Concrete, as is well known, offers a great resistance to compression; but as its tensile strength averages only about one twenty-fifth of its strength to resist compression, it has but little transverse strength. It has been sufficiently proven, however, that the tensile strength may be made equal to the resistance to compression by imbedding twisted iron bars, bands, or hoops near the bottom of the concrete, or in that portion which is in tension. In this way concrete may be made to sustain great transverse loads, and this mode of construction has been used quite extensively in California.

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"In building the footings with steel beams the strength of the concrete is practically wasted, while in this method of construction it is all utilized. It has been proved that the entire tensile strength of the twisted bars can be utilized, and being held continuously along their entire length by the concrete, as a screw bolt is held by the nut, they neither draw nor stretch, except as the concrete extends with them.

"In building concrete footings, a layer of concrete from three to six inches thick, made in the proportion of one to three, should first be laid, and the iron bars laid on and tamped down into it. Another layer of four inches, mixed in the same proportion, should then be laid, after which the concrete may be mixed in the proportion of one to six. Each layer should be laid before the preceding layer has had time to harden, otherwise they may not adhere thoroughly.

TABLE III.

Proportions and Strength of Concrete Footings with Twisted Iron Tension Bars.

WIDTH OF FOOTING IN FEET.	THICKNESS OF CONCRETE.		WIDTH OF STONE FOOTING		DIST. BETWEEN CENTRES OF BARS.	SIZE OF SQUARE BAR.	SAFE LOAD PER LINEAL FOOT.	SIZE OF SQUARE BAR.	SAFE LOAD PER LINEAL FOOT.
	Ft.	In.	Ft.	In.	Inches.	Inches.	Tons.	Inches.	Tons.
20	3	6	6	0	8	2	78	1 7/8	63
18	3	3	5	6	8	2	76	1 3/4	56
16	2	10	5	0	7	1 3/4	73	1 1/2	50
14	2	8	4	8	7	1 5/8	70	1 3/8	49
12	2	6	4	4	6	1 3/8	65	1 1/4	48
10	2	3	4	0	6	1 1/4	65	1	42
8	2	0	4	0	6	1	60	3/4	40
6	1	8	3	6	6	3/4	55	1/2	29

"The writer has prepared Table III., giving the strength and proportions of footings constructed in this way, which he believes to have a large margin of safety. Two sizes of bars are given, with the corresponding safe loads for the footings, the other measurements applying to both cases. The measurements in the third column refer to the width of the brick or stone footing resting on the concrete. The greater the width of this footing in proportion to the width of the concrete, the less will be the strain on the tension rods.

"*Piers.* — Footings for piers may be built in the same manner, with two sets of bars laid crossways of each other, and also diagonally. In the case of piers, the corners should be cut off at an angle of 45°. The same size of bars should be used for a pier as for a wall, whose footings have the same projection beyond the masonry, and the depth of the concrete should be the same."

This principle may be very advantageously followed in light foundation work. The thickness of the concrete may readily be reduced from thirty-six inches to fifteen inches, with great saving in cost. The width of the footing is determined by the character of the soil. The thickness depends on the load, the iron and concrete areas being properly proportioned one to another, assuming that there should be about one hundred and fifty times the area of the iron in the area of concrete; that is, if the area of iron required to provide the necessary strength to the concrete to tensile strains is one square inch, the area of concrete used in that section should be at least one hundred and fifty square inches.

A building bearing on soil capable of sustaining three tons per square foot, with a load of say ten tons to the linear foot of wall, would require a concrete foundation about three feet four inches wide and sixteen inches thick, with three three-quarter inch rods set three inches from the bottom, twelve inches on centres.

R. F. TUCKER.

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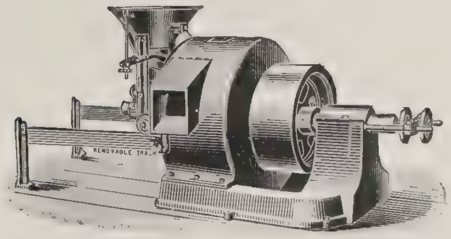

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AMERICAN PORTLAND CEMENT.

EDITOR OF THE BRICKBUILDER:

Sir, — In looking over the articles in your paper on cement and cement work for the past two months, one cannot help wondering how long creditable journals propose to publish articles which tend to destroy confidence in the product of an important American industry without first finding out whether the writer is sufficiently versed to treat the subject fairly. In Mr. R. F. Tucker's paper in your August number we find the following: —

> "The German Portlands are the finest in the world in all respects, and an engineer may be at ease when his work is being done with these standard cements. . . . The Portland cements of American manufacture have a long road to travel before reaching the standard of excellence achieved by our rivals across the water. . . . The writer is not aware of the existence of a cement plant in the United States in which the production is carried on precisely as in Europe, nor is the term 'Portland' justly assumed by a great majority of American cements."

Mr. Tucker before writing certainly could not have made himself acquainted with the existing facts relative to the manufacture of cements in France, Denmark, and the United States.

There has been some low-grade Portland cement made in this country, owing to the fact that there was a market for it, but the manufacturers have always found that they could not compete with the English and Belgian factories for this trade, so have usually manufactured the highest grade of material, which brings in the New York, Philadelphia, and Baltimore markets from ten to thirty cents per barrel more than the highest priced English and Belgian brands. The reason the high-grade American cements command this advance in price is because they are equal in quality to the French, Danish, and German Portlands, and enter largely into competition with them for the best grade of work.

In a paper read before the members of the American Society of Civil Engineers, Nov. 7, 1877, by Capt. W. W. McClay, we find the following: —

"About two years ago, in preparing the specifications for a large quantity of Portland cement to be delivered in this city, the writer, in the test for fineness, required that at least eighty-five per cent of the cement should pass through a sieve containing twenty-five hundred meshes per square inch, that the weight of the struck bushel should not be less than one hundred and fifteen pounds, and the tensile strength, for the seven days' test, at least two hundred and fifty pounds per square inch. Several English manufacturers applied to by the importers to fill this contract declined, except for unusually high prices, alleging that the cement as ordinarily burnt, if ground to the degree of fineness required, would not come up to the weight required per struck bushel, and that in consequence of the extra burning producing a harder material to grind, much unnecessary expense would be entailed upon them. The cement was eventually supplied by the Burham Company at the ordinary market price, and although passing the test for fineness, never came quite up to the standard required in the weight per struck bushel.

"In contrast to this may be mentioned the recent experience of the writer with the Coplay Cement Manufacturing Company in supplying the Saylors American Portland cement under a contract in which the test for fineness only required that eighty per cent of the cement should pass through a sieve with twenty-five hundred meshes per square inch, that the weight of the struck bushel should not be less than one hundred and ten pounds, and that the tensile strength per square inch at the end of seven days should be two hundred and fifty pounds; or in other words, a lower standard of fineness and weight than in the contract above alluded to, which was filled by the Burham Company. When this American Portland cement was supplied on the work, it was found to exceed considerably the requirements of the three tests, averaging over one hundred and twenty pounds per struck bushel, over two hundred and fifty pounds per square inch in tensile strength, and over ninety per cent passing through a sieve containing twenty-five hundred meshes to the square inch."

It will be seen by the above account that as far back as 1877, before practically any German cements were sent to this country, the Coplay Cement Company was making Portland cement that would fill the strictest specifications then in use; and as the standard of excellency advanced in Germany under careful investigation, so it advanced in the works located in Lehigh County, Pa., until last fall when Messrs. Cope & Stewardson of this city placed plans and specifications on the market for a large building to be erected at 10th and Filbert Streets, Philadelphia, the specifications calling for a concrete foundation made with a Portland cement of either American or foreign manufacture that would show a fineness of

100% to pass a sieve with 5,800 meshes per square inch.
95% " " " " " 10,000 " " " "
75% " " " " " 40,000 " " " "

A tensile strength of

450 lbs. neat in 7 days, 1 inch briquette.
600 " " " 28 " 1 " "
125 " 3 sand " 7 " 1 " "
200 " 3 " " 28 " 1 " "

Mannheimer Portland Cement.

UNEXCELLED IN QUALITY.

"The results of tests with standard quartz are far above the average of most cements."
CLIFFORD RICHARDSON,
Inspector of Asphalt and Cements,
Engineer Dept., Washington, D. C.

"This brand of Portland Cement was found especially qualified for the purpose of concrete casting on account of its perfect uniformity, intensive fineness, progressive induration after the first setting, and of its great tensile and crushing strength."
Vide Report of CARL A. TRIK,
Superintendent of Bridges, Philadelphia,
On Concrete Arch Highway Bridge over Pennypack Creek.

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IMPORTER AND SOLE AGENT FOR UNITED STATES, CANADA AND CUBA.

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302 Walnut Street, PHILADELPHIA.

ESTABLISHED 1858. **WILLIAM N. BEACH, President.**

LAWRENCEVILLE CEMENT CO.,

MANUFACTURERS OF

BEACH'S ROSENDALE HYDRAULIC CEMENT.

Guaranteed to stand all required tests. **115 Broadway, NEW YORK.**

The Coplay Cement Company was the only bidder on the cement, and we were informed by the contractors, Messrs. F. M. Harris & Co., of Philadelphia, that they could not get an importer of a German brand to guarantee his cement to meet these specifications for fineness. Five thousand barrels of "Saylors American Portland cement" were used on this work, all of which successfully passed the tests. Cases of this kind and the one Mr. McClay cites in his paper are of frequent occurrence. The St. Louis Water Works has used large quantities of the best known German cements and some American Portlands for several years passed, but this year the specifications call exclusively for cement of American make, with the same requirements as they previously had when they used foreign cement, and it is well known that they had plenty of bidders, the contract being awarded to one of the works in Lehigh County, Pa.

If Mr. Tucker, or any other party who is willing to investigate American Portland cement, will take a trip to Coplay, Lehigh County, Pa., he will find a mill making Portland cement precisely as it is made in all the leading factories in Germany; in fact, he would not have to go very far from Coplay to find several such works, some of which have placed tons and tons of their product in the most important engineering structures built in this country during the past fifteen or twenty years; and after making this trip, if he would then visit many of the leading works in England, he would find, instead of the well-built buildings, the most improved labor-saving machinery, and the nicely fitted up laboratories where the manufacture is carefully watched in all its stages (which he saw at Coplay), a lot of old sheds, with little or no care being taken to insure a perfect mixing or burning of the composition. Crossing over the channel to the Societe Anonyme des Ciments Français works at Boulogne-Ser-Mer, France, and on to the great German works of F. O. Alsen & Co., H. Manske & Co., and Dyckerhoff & Son, and not until arriving at the Aalborg Portland Cement Works at Aalborg, Den., would he find anything that would surpass what he saw in the Coplay region. The works at Aalborg are as near perfect and make as near a perfect Portland cement as the consummated skill and experience of the leading chemists and engineers of Europe can produce. A mill of the same description, with the addition of a few American labor-saving appliances, is now being erected at Coplay, Pa., by the Coplay Cement Company, as an addition to their already large plant.

Anybody at all conversant with the process of manufacture in the leading works in Germany and America knows by Mr. Tucker's remarks that he has either never seen cement made in these factories, or else when in the mills did not know enough about cement manufacturing to see the process of making the product was the same, but unfortunately very few of the readers of Mr. Tucker's article have ever examined the mode of manufacture in Europe or America, and have not to any large extent made careful comparison between the best product of the American and that of the foreign, so they do not un-

ATLAS PORTLAND CEMENT.

WARRANTED EQUAL TO ANY AND SUPERIOR TO MOST OF THE FOREIGN BRANDS.

OFFICIAL TESTS, Nos. 3567 and 3568, made by the DEPARTMENT OF DOCKS, New York, March 31, 1834, being part of contract No. 464 for 8,000 barrels.

TENSILE STRENGTH, 7 days, neat cement . . . . 622 lbs.
" " 7 days, 2 parts sand to 1 of cement . . . . 332 lbs.
Parts steamed and boiled . . . . Satisfactory.

All our product is of the first quality, and is the only American Portland Cement that meets the requirements of the U. S. Government and the New York Department of Docks We make no second grade or so-called improved cement.

ATLAS CEMENT COMPANY, 143 LIBERTY STREET, NEW YORK CITY.

Holy Trinity Parish House,

PHILADELPHIA.

◆◆

Buff and Pompeian Brick Laid in Clinton Hematite Red.

◆◆

Messrs. Hewitt & Bro., Architects,
PHILADELPHIA.

◆◆

Messrs. Dorsey & Smith, Builders,
PHILADELPHIA.

◆◆

. . ILLUSTRATION FROM . .
"A Little Talk on Metallic Paints and Mortar Colors."

Write for this book, mailed free on application to the Publishers,

. . . . THE . . . .
CLINTON METALLIC PAINT CO,
OF CLINTON, N. Y.

. . . . MANUFACTURERS OF. . . .

High Grade Mortar Colors and Metallic Paints.

Eastern New England Agents:

FISKE, HOMES & CO., 164 Devonshire Street, - - - - - BOSTON.

derstand the injustice Mr. Tucker has done the American Portland cement.

In reference to the misuse of the term "Portland," we personally do not know of a brand of American Portland cement that comes in competition with us but what is a true Portland cement in every sense of the word, and we feel that it is high time that such public criticism of the American Portland cement industry should cease.

Yours respectfully,
Wm. G. Hartranft,
Vice-President Commercial Wood and Cement Company.

IN REPLY TO MR. HARTRANFT AND MR. NEWBERRY.

THE criticism of the writer's articles on Portland cements calls for some comment, although the arguments presented are not in the least conclusive.

Does the manufacturer imagine that his is the only voice that should be heard? Has the consumer no option as to the brands of cement he is to use? Has he no right to express his views upon a subject upon which perhaps his reputation and his fortune wholly depend?

There has been no wholesale condemnation of the American product. The writer is well aware that some American manufacturers can produce a cement equal, nay superior, to the foreign article in strength and firmness. He knows well enough that many works of great importance have been built wholly of domestic cements, and fulfilled very rigid specification. He knows well enough that when certain manufacturers start in to produce a given grade of cement for a given contract that they can do it; but when he goes into the open market to buy a dozen or a hundred barrels of cement for a certain piece of work, why is it that he does not call for American brands? Is it prejudice? Other things being equal, is there any reason for preferring the German or the Danish or the French or any other foreign brand? But every consumer knows and every manufacturer knows that we don't go into the open market and buy American Portlands when important work is to be done. We use it only when it is furnished direct and with special care; and when the writer says that the American brands have a long road to travel, he means precisely that the uncertainty has been caused perhaps by more or less unfortunate experiences; but surely, reputable journals who desire to represent both sides of an argument will publish the consumers' side as well as the manufacturers'. The readers of these articles are intelligent people, and they know that American cement of the highest quality is produced and that they can buy it, but they are not going to do it without taking proper precautions.

Manufacturers who are as careful as Messrs. Manske & Co. or Messrs. Dyckerhoff & Co. and others to send out cement only of excellent quality need not fear for the future, because we believe that the American cement will always be preferred, all conditions being equal. A specimen of an imported cement was recently taken at random from a number of barrels furnished to a certain contractor, and at the end of twenty-four days the testing machine failed to break a one-inch square section at one thousand pounds. When American cements are produced of such uniformity that the consumer may be certain of its work, then the criticism of domestic cements will cease; but while there is danger of irregularity in any particular brand, that particular brand is going to be used with caution. No one is more interested in the American cements or desires to see them succeed more than the writer, and when he is assured that the results achieved by the use of any brands of American cement taken as they come will be as satisfactory as those obtained with foreign brands, the writer, as a consumer, is ready to give the American brand a wide preference.

Ross F. Tucker.

A CORRECTION.

IN the July number an article on Mortar Colors contained the statement that in using "hematite red" it was necessary to allow fifty or sixty pounds to a thousand brick. Mr. F. DeW. Smyth, the treasurer of the Clinton Metallic Paint Company, who manufacture this brand, writes us that this is too liberal an allowance, and that the actual amount needed is never over forty-five pounds, and if properly used thirty-five pounds should suffice. In recognition of the full strength of this color, we make the correction.

Alsen's Portland Cement.

The strongest, finest ground, and most uniform Cement in the world. Permits the admixture of more sand than any other, and is the best for mortar or stuccoing.

143 Liberty Street, = = New York.

Peerless Mortar Colors,

RED, BLACK, BROWN, AND BUFF.

Our New Colors are novel and attractive and well worthy of attention. MOSS GREEN, ROYAL PURPLE, POMPEIIAN BUFF, FRENCH GRAY, COLONIAL DRAB.

All Colors Permanent and Superior to any Article in Use.

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Painters' and Builders' Supplies,

ESTABLISHED 1844. PHILADELPHIA, PA.

SEND FOR CIRCULAR AND CATALOGUE.

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C. I. O. P. CO.
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MANUFACTURERS OF
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Metallic and Graphite Paints,
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Cleveland, O.

THE MASON CONTRACTOR.

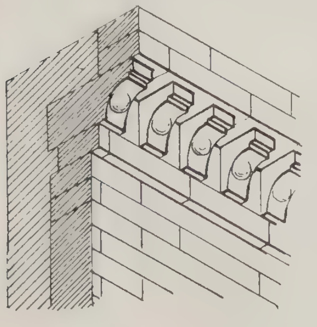
A Department conducted in the interests of the Builder, and the Contractor for Brickwork.

INTRODUCTION.

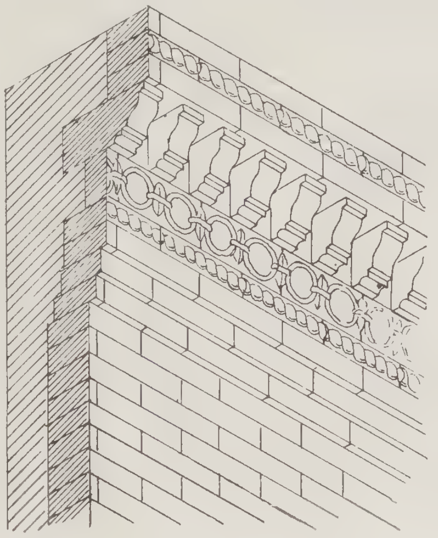
IT is our purpose, in establishing this regular department, to endeavor to make it of great practical value to thousands of contractors and builders, particularly in the matter of designs for all decorative features of buildings, such as cornices, chimney-tops, belt courses, arches, panels, etc., etc., showing these by drawings that will be a sufficient guide for the execution of the work. It is not our purpose to supplant the architect in any way. We believe that no building should be done without his professional service; yet we recognize that there are thousands of the smaller towns where, at the present time, his services are not available except for the most important work, in which case an architect in some city, perhaps far distant, is engaged. In these towns a builder must also be architect; and while the general plan and design of the building are worked out in consultation with the owner, the builder is thrown upon his own resources for the designs of details. To be of assistance in this is the chief aim in establishing this department. In it we shall publish a large number of designs for such details, and also some designs for entire buildings of the smaller and more common type, particularly cottages, stores, and schoolhouses. We shall endeavor to make the department, also, a bureau of information on subjects connected with practical building, and, as we have a large staff of competent writers in all parts of the country, we feel certain we can answer any reasonable question. This staff is composed almost entirely of men engaged in actual contracting, who hold themselves ready to write upon any special subject for which they think their experience fits them. We solicit a trial subscription from every builder, and would also be glad to receive suggestions for the improvement of this part of THE BRICKBUILDER.

CORNICES OF PRESSED AND ORNAMENTAL BRICK.

THE two cornices here illustrated by isometric view are best executed in smooth, regular brick, of even color, for two reasons: first, they should be laid evenly, which is impossible with brick of untrue shape and varying size; and second, the details are so small in scale that all difference in local coloring should be avoided. It is a mistake to execute decorative brickwork in strongly mottled or variegated brick. In this work the design is brought out by light and shade. A course is projected an inch in order to produce a horizontal line by the shadow it casts. A row of dentils counts only when the projecting faces are in full light, the reveals in full shadow. A piece of decorative brickwork needs the strongest sunlight from the right direction to overpower even moderate differences in the color of the brick; but when seen in ordinary light, difference in color competes with and destroys the light and shade effect. For example, in a dentil course certain projecting bricks may be dark, recessed bricks light, the difference being greater than the light and shade. The one neutralizes the other, and there is a break in the course. Occasional breaks may in some instances lend charm to detail, just as in some of the colored marble work of Italy a master hand has put in, here and there, a bit of color in contrast to the general scheme to break the monotony, but the danger of discord is far greater than the danger of monotony. But to return to our subject.



The small cornice may be used for a brick porch, a bay-window, or some portion of a building which needs a small cornice, or it may be used for a belt course, in which case it would only count for five courses, or about a foot. Taking a brick $2\frac{3}{8}$ x $8\frac{3}{8}$ x $4\frac{1}{8}$ at $25, and for the ornamental brick, Ittner's 33, for instance, at eight cents each, the stock for this cornice would cost from thirty-eight to forty cents per running foot.



The larger cornice will answer for a building of very respectable size. It contains three patterns of ornamental brick, and Mr. Ittner's calalogue being the only one at hand at this writing we will select from that. For the rope moulding, No. 88 is satisfactory, and costs eight cents; No. 22 or 23 at five and one half cents will answer for the dentil or bracket course, though these are not exactly like the design. For the five-inch course, No. 139 will go, though this is double-size brick and rather expensive, costing twelve cents. At these figures the stock will cost very close to eighty cents per lineal foot, in first-quality red pressed brick, the face work, of course, only being estimated. For the five-inch course a number of other patterns could be substituted, as, for example, to again quote from Ittner's catalogue, 110, 111, 113, 114, and 120.

GEOMETRICAL PATTERNS IN BRICKWORK.

I.

AMERICAN BOND WITH TWO COLORS.

THE value of brick as a material for ornamenting flat surfaces with geometrical designs has been recognized in every brick-building period and country. Italy, Spain, and France contain many beautiful examples of such work, while much of the more recent work in England depends to a considerable degree upon the architectural effect of diaper patterns. In this series of articles it will be the aim to present a number of patterns, from the simplest to the most complex, in each of the principal bonds used in brickwork, and to give a number of examples for their use, in a variety of ways.

The simplest and most common bond is the so-called "American," consisting of courses of stretchers, evenly breaking joint. This is not properly a bond, though it is called so, as it depends upon metal ties or upon bricks set diagonally across the wall, one corner fitting into a V cut out of the backs of the front brick. The patterns formed with it are not so interesting as those of the other bonds, but there are many instances where it can be used to advantage, and some of these will be pointed out in these articles.

To get any effect whatever with this bond it is evident that two colors of brick must be used, as the mortar joints give no character to the work. In fact for any effect in diaper patterns two and sometimes three colors are necessary. These need not be contrasting colors, and often it is best they should not be; two shades of one color are sufficient, or even two *textures* of identical color. A light red smoothly pressed brick with a dark red brick a very little rougher

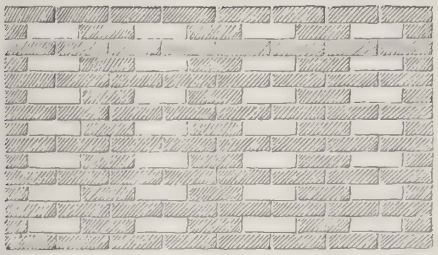


Fig. 1.

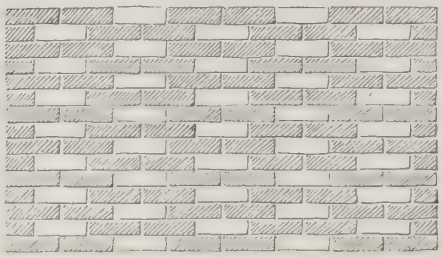
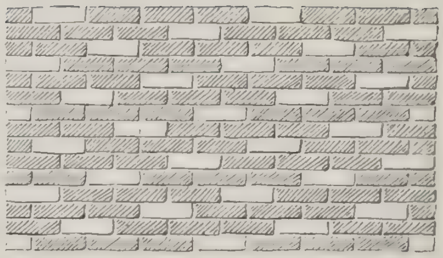


Fig. 2.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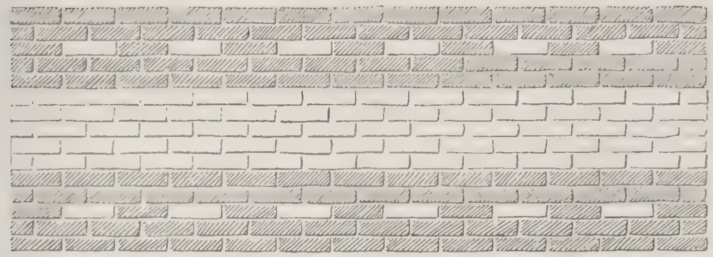
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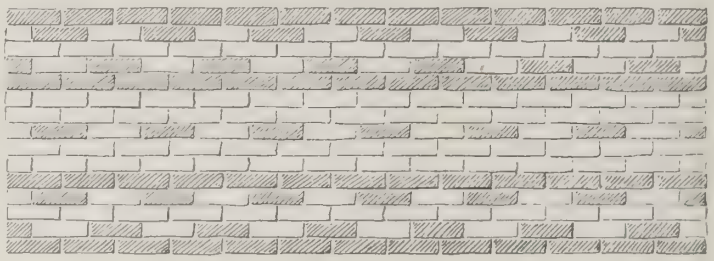
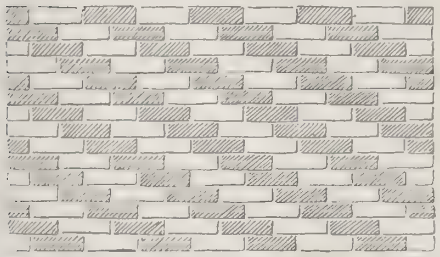


Fig. 5.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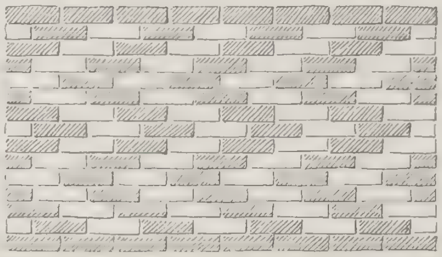
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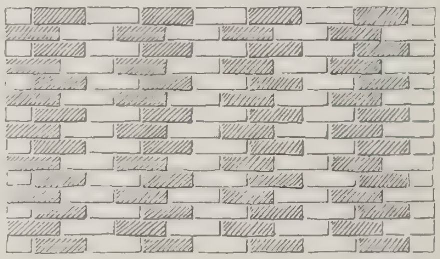
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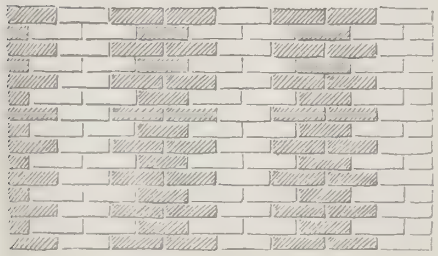
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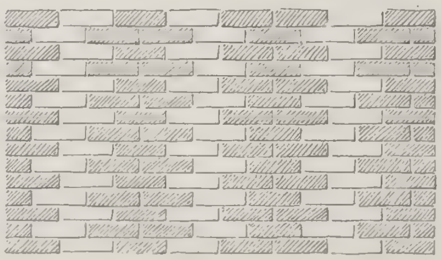


Fig. 10

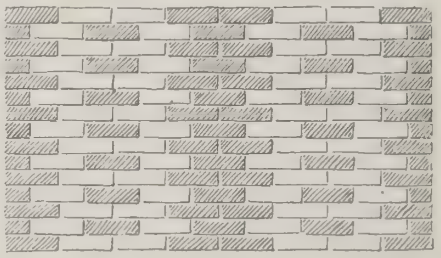


Fig. 11

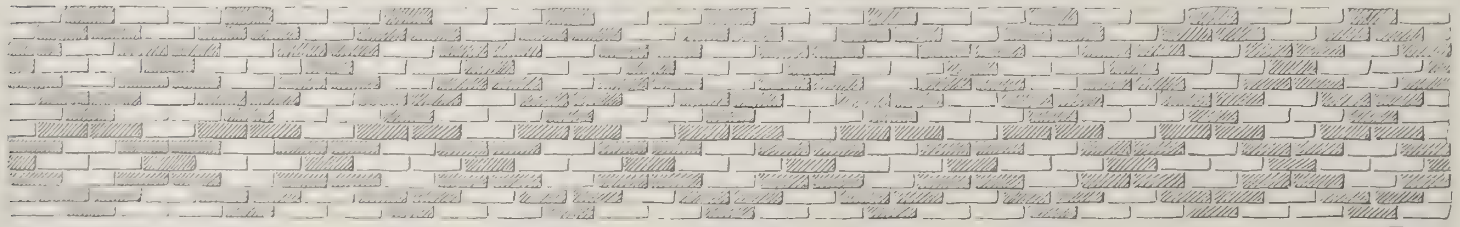


Fig. 12.

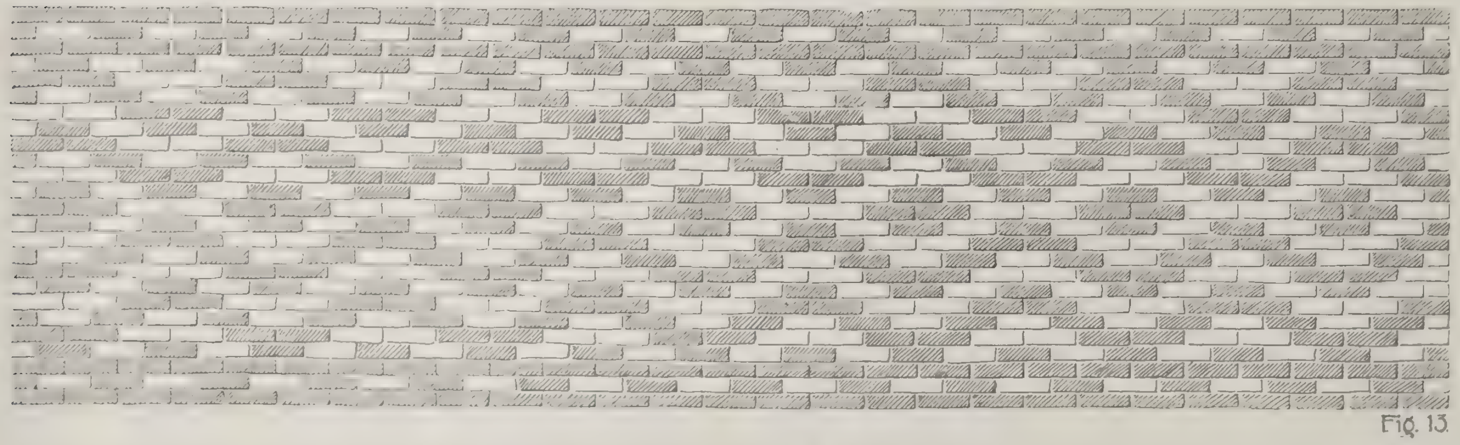


Fig. 13.

MOTIVE FOR DECORATIVE BRICKWORK.

in texture will give the most pronounced contrast. A red and black, a red and buff, a red and gray, will all make good combinations, especially in common brick.

On the opposite page are grouped a number of the simpler patterns, good for "all over" designs as they are called, that is, for unlimited surfaces.

Fig. 1 is one of the simplest courses of one color alternating with courses made up of brick of both colors, these being laid alternately in the course. In Fig. 2 this is varied slightly by laying two dark and a light in a course, repeating this, and placing the light in one course to bond with the two dark brick in the course below. Fig. 3 shows a still further variation obtained by laying three dark and one light, placing the light to bond with the first two dark of the course below.

In Figs. 4 and 5 are shown two motives that cover a surface with alternating bands or stripes. These can also be used alone as they are shown in the plate, for low walls.

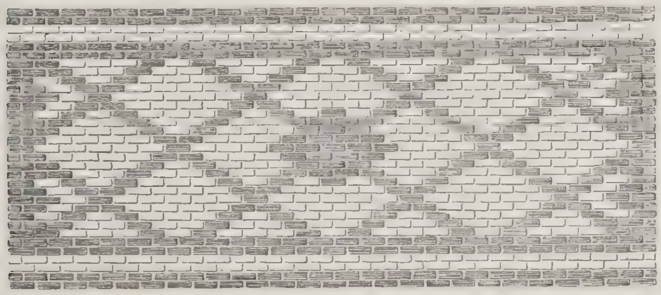
Fig. 6 is a pattern that should be used with considerable discrimination, as it is not likely to fit the majority of places. The same can be said to a lesser degree of Figs. 7 and 8.

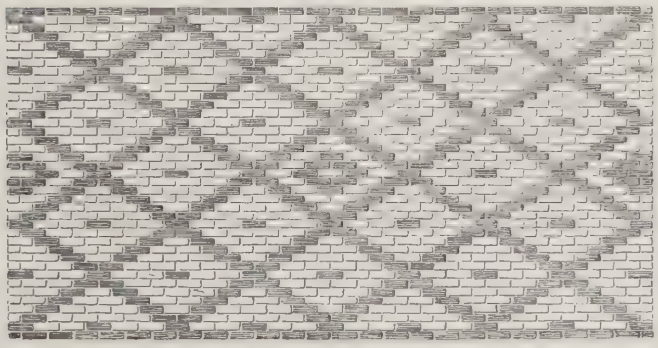
Figs. 9, 10, and 11 show similar motives and variations to Figs. 1, 2, and 3, and are best confined to small surfaces as illustrated in examples a little further.

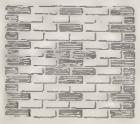
In Fig. 12 we come to the simplest form of the diamond diaper pattern. This pattern is capable of almost endless variations in treatment, depending upon the sizes of the diamonds and the further treatment of these in point of detail.

Fig. 13 is another band pattern, based upon the diamond motive, as will be seen by examination.

One of the most appropriate uses for patterns of this class is found in the construction of enclosure walls. These walls may be divided into sections, with brick posts or buttresses to stiffen them, but they are better built hollow, and tied with the clever device known as Morse's Patent Wall Tie, a heavy wire, so looped at either end as to get a secure hold in the mortar. A salt glazed coping should be placed on the top, and then to finish give some flowing vine a chance to climb it here and there. For this work, cheap cull brick could be bought, sorted, and laid. It would need only two or three good examples to create, in almost any locality, an entirely new line of mason contractors' work. As an instance, two applications of the diamond diaper pattern are here given. They are formed of diamonds of the same size, and each has the centre marked. Beyond the difference in these centres the single dark brick in the centre of each diamond is all that makes the difference between them, although the second is a diamond higher and possesses no strongly marked border, — a necessary factor in all over designs applied to a limited space. The second of these designs is taken from a market building in the Avenue des Gobelins, Paris. There and throughout France, brickwork in this bond, and only a single brick thick, is largely used as a filling, or curtain wall for iron or even frame buildings, the brickwork being laid between the iron or wooden posts that do the work in the structure.







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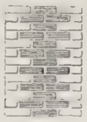
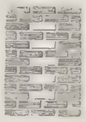
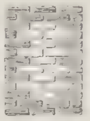


b



c



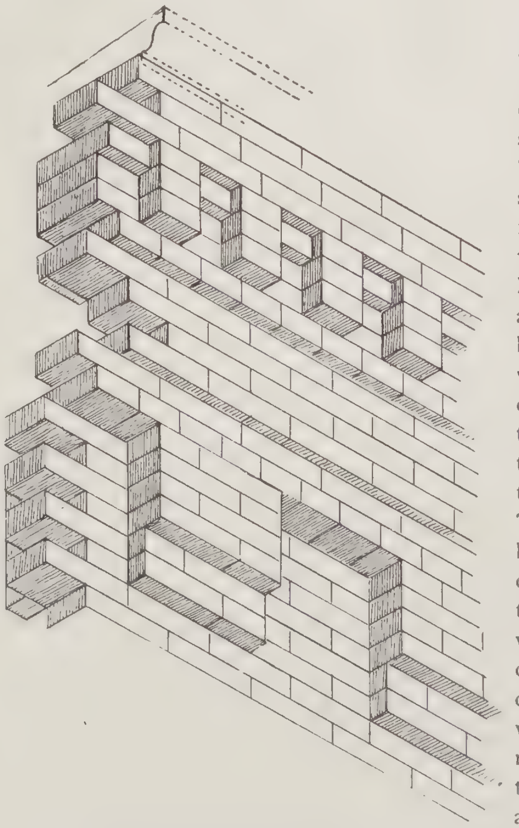
d

As examples of brickwork serving this purpose, in small places, these designs are given. In *a* we have an application of the motive shown in Fig. 11; *b* shows the motive common to 9, 10, and 11; *d* is this motive reversed, the light for the dark; and *c* is the motive of Fig. 1. These small motives can be used also for posts.

In the next issue another full-page plate of American bond motives will be published, with several examples of their application.

A FACTORY CORNICE.

ONE of the best chances for effective brickwork is offered in the construction of large factory and warehouse buildings. These are usually built of good common red brick, with liberal joints of white mortar, giving a result that is almost always pleasing, never offensive. This class of brickwork, in fact, we find used in some of the most expensive buildings of our large cities, where it is used for the plain wall surfaces, the quoins, sills, lintels, cornice, belt courses, etc., being of light stone or terra-cotta. The cornice above shown by an isometric view is twenty-one courses high, and fitted for a three or four story building. It will work out well, requiring about thirty-two brick to the lineal foot, for the *front* work. These brick should be a little more carefully selected than for the main wall, and laid necessarily with more care. It would be well to use a cement mortar, at least for the upper courses, and the top should be tinned or finished with a terra-cotta coping; though if the top courses are carefully laid in cement mortar with a coating of same spread over the top, the tin or terra-cotta may be dispensed with.



Such a cornice will lend dignity and architectural character to the plainest, most utilitarian building. We would like to have our readers estimate the cost of laying this cornice and submit same for publication in our next issue.

THE MANUFACTURER.

A Department devoted to the Market Side of Clay Production.

EXPORTS AND IMPORTS.

THE following facts and figures concerning the trade of brick and kindred lines, with the United States and other countries, have been obtained by the courteous permission of the Treasury Department, from the latest corrected statistics covering these subjects.

The dutiable imports of clays, including kaolin, in July, amounted to 5,517 tons, valued at $41,377, against 5,698 tons, or $41,871 worth in July a year ago. The present year's values, to date of August 1, amounted to 41,167 tons, valued at $328,004, as compared with 41,871 tons, or $366 worth for the corresponding seven months in last year.

The total domestic exports of brick for July amounted to $10,261, against the double amount of $22,167 in July, a year ago; but the year's record, so far, brings up this average. The value for the seven months gone is $86,125, being an increase over the same period in last year, when the value was $80,380.

Of this total there was exported in July, 425,000 building bricks, valued at $2,816, against 522,000 in July, last year, or $4,730 worth. This year's values so far amount to 3,073,000, valued at $22,729, being an increase over this period in last year, when the values were 2,687,000, representing $21,284.

Of this total also were imported fire bricks in July to the value of $7,445, against $17,437 in July last year. The present year's business in this line so far has footed up $63,396, against $59,096 during the corresponding seven months in last year.

There were no re-exports of clays in July against 85 tons, or $802 worth during July last year. This year's values, to date of August 1, have amounted to 50 tons, or $214 worth, as compared with 144 tons, valued at $1,260, in the same period of 1893.

Remaining in customs warehouse in July were 1,075 tons of clay, including kaolin, valued at $8,395, against 1,268 tons, or $10,465 worth, in July last year.

A comparative summary of the amounts and values of clays imported into the Uniied States during the last two fiscal years, that ended with June 30, 1893, and June 30, 1894, reveal some interesting facts.

The total amount exported into the United States during the twelve months that ended with June last was 67,330 tons, valued at $526,543, as compared with 79,200 tons, or $635,368 worth in the previous twelve months that ended with June 30, 1893. From June, 1893 to July, 1894, the last fiscal year, for which official statistics have been compiled, the values for each month, with its comparison of the preceding twelve months, stands as follows: for July, 1893, there were imported 5,678 tons, valued at $41,871, against 4,488 tons, or $36,918 worth in the same month of 1892; in August these values were 5,965 tons, worth $42,033, against 9,902 tons, or $75,913, in August, 1892; in September, 5,330 tons, worth $40,908, against 5,427 tons, worth $45,851, in September, 1892; October, 7,005 tons, or $54,859, against 5,362 tons, or $50,097, in October, 1892; November, 4,000 tons, or $33,876, against 8,148 tons, or $66,322, in November, 1892; December, 3,702 tons, or $26,369, against 4,166 tons, or $35,636, in December, 1892; January, 1894, 5,797 tons, or $47,087, against the preceding January, 1893; February, 4,683 tons, or $37,186, against 8,076 tons, or $61,692, in February, 1893; March, 5,431 tons, or $44,236, against 7,659 tons, or $60,215, for March, 1893; April, 6,944 tons, or $56,713, against 7,509 tons, or $57,057, for April, 1893; May, 7,367 tons, or $58,252, against 6,942 tons, or $43,153, against 6,912 tons, or $51,356, in June, 1893. This twelve months' record shows a falling off in the fiscal year of $108,825, a monthly average in the last fiscal year of $43,879, as compared with $52,947, for the average of the twelve months preceding.

This summary is especially interesting in pointing to the decrease in these imports, for the reason that they suggest a hopeful finale as to the ultimate amount of labor and research expended upon our own home discoveries and possibilities in clay and kaolin mines.

BRICK manufacturers, having stock in two colors, can use, to good advantage, the material on the preceding two pages, by placing this number in the hands of local architects and builders, calling attention at the same time to the shades they manufacture.

LOCAL ADVERTISING.

I.

A SERIES OF SUGGESTIONS FOR THE AVERAGE BRICKMAKER.

IF you are making only the ordinary grade of common brick and have no wagons painted with your name, a stock of inexpensive placards can be laid in and if carefully used last a long while and do a great deal of good. These placards can be printed or even stencilled on cloth or some cheap paper board, such as a white surface strawboard. They can be fastened to the side of the wagon, or inserted in a split stick, which can be poked down among the bricks; this latter way is much the better. People will notice it, perhaps talk about it, and little orders that count in the long run will come your way to more than pay for it. As an instance of taking advantage of such things as a dump cart of dirt for advertising, that past master in the art of theatrical advertising, Mr. B. F. Keith, may be mentioned. Mr. Keith originated and has made a fortune out of the continuous performance vaudeville entertainment. He owns theatres in New York, Philadelphia, Providence, and Boston. Here he has built unquestionably the finest theatre of America. Long before the public began to realize what was really going on, thousands of dump-cart loads of dirt were hauled out of the very heart of Boston's retail section, through streets packed with people. Each cart bore a placard, stuck in the dirt, reading, "Excavated from the site of Keith's new theatre." Wagons ordinarily painted and lettered would have passed unnoticed among the thousands of similar ones, but these rough tipcarts with their unique banner made people notice them. This was the beginning of a series of most clever advertisements culminating in a grand opening, since which the new theatre has been full day after day. This idea of placarding is not new, only the particular way of doing it is novel. The cheapest, simplest way of doing it was the best, and yet it was the least common.

IT might pay to send your copy to some mason contractor, who may have on hand a job to which the factory cornice on the preceding would apply. It would count the way all such little business courtesies count, and enterprising men are always on the lookout for chances to pay them.

THE cornices of ornamental brick on page 213 can be built substantially like the designs, from the stock of any manufacturer who has a line of patterns that he makes, and those who are so situated can use this issue to advantage by sending copies marked, with a letter quoting price, to some of the leading builders in their localities.

DESIGNS and details for eight $2,000 brick houses in our special double number. Price per copy, postpaid, 50 cents.

THE BRICKBUILDER

VOL. III. BOSTON, NOVEMBER, 1894. NO. 11.

THE ENDURANCE OF STRUCTURAL METAL WORK.

IT is a cause for considerable wonder that iron, which in its various allotropic modifications has been used for so many centuries in connection with building operations, should still, in some of its peculiar qualities, be almost an indeterminate factor. We know that iron rusts. There is abundant visible demonstration that the metal will in time be entirely dissolved by the action of the elements, and yet we continue to build ten and twenty story buildings, depending for their ultimate strength in a great many cases upon the endurance of a few iron rivets. We naturally believe that the iron or the steel as employed in buildings will not be seriously affected by rust, otherwise no sane architect would dare to use the material; but when we consider how little is actually and positively known about the metal, and also consider what the consequence would be in one of the tall sky scrapers if a single joint in some of the lower connections should give way, it becomes of the most extreme importance to architects and constructors generally to gather together all the available experience relating to the subject of the preservation of structural iron or steel. At the recent convention of the American Institute of Architects held in New York, Oct. 16, the subject of the evening's discussion was the very important one of "High Buildings and Good Architecture." A paper was read by Mr. T. M. Clark, of Boston, entitled "Protection Against Fire," which treated of the mechanical question of the construction of such buildings, and broadly assumed that if the steel cage which forms the usual construction of nearly all tall buildings could be protected from fire, the building would be indestructible. The discussion of the evening was concentrated around this particular phase of the paper, and was set in motion by Mr. George B. Post, of New York, by a statement that it was his positive opinion, formed after considerable study of the subject and consultation with the best engineers he could get hold of, that the life of buildings constructed with steel cages would be short. They might last longer than he would, but he believed that there were men listening to him who would live to see the necessity of taking down many of such buildings or else of resorting continually to most radical systems of repair in construction. Mr. Post further stated that, so far as he knew, it was impossible with paint or asphaltum to protect a great system of steel or iron construction so that it would not be assailed by rust. A natural inference is that sooner or later the metal would be so corroded that it would cease to be safe.

This is by no means a new difficulty. The question has probably been raised with every large building which has been erected within the last twelve or fifteen years, and it has caused a great deal of sleepless thought on the part of architects and owners before either could feel justified in adopting a material which so palpably appears to be short-lived. One of the things that foreigners urge most strongly against our system of architecture of to-day is the fact that we build tall buildings depending, not upon inert masses of masonry, but upon the strength of metal connections which are sure to rust. Mr. Post cited the case of some iron beams which he removed from the ceiling of the old pressroom of the New York *Times* building a few years ago. These had been for thirty-five years encased in brickwork, being connected by eight-inch arches levelled up over the haunches with concrete. They had been subjected on one side to occasional small quantities of live steam, and when taken out very many of them were entirely destroyed by rust so they could be broken between the fingers. Mr. Post cited another instance of a water tank that had been in use for twenty years, the inside five-eighths-inch iron rods of which he found had rusted completely away. He objected not so much to a possible construction of iron work made with the greatest possible care, but rather to such construction as he had seen going up in the city of New York during the past few years, where the iron columns were given a very light coat of paint and very little attempt made to protect the joints. He presumed that the great mass of joints would remain for a considerable period perfectly sound and safe, but with several hundred bearing joints in a building, put up without any very special care, with a great deal of recklessness in many cases, with no protection except eight inches of ordinary brickwork, he did not believe such buildings would stand for any great time with perfect safety, but that the construction of many of them would last no longer than did the beams he took out of the *Times* building. He stated that he never had dared to use a cage enclosed in masonry as the construction of a building; but he had built the cage detached inside, anchoring the walls to it, so the metal could be examined at the joints, and, in case of corrosion, painted or repaired.

It is well known that cast iron will corrode much less rapidly than wrought iron, and Mr. Post accordingly suggested that a cage construction of cast-iron columns incorporated in the walls, with cast-iron girders locked to the columns by a mechanical joint, without steel or iron rivets or bolts, would make a cage construction which would be reasonably free for a long period from the dangerous effects of corrosion. With cast iron the danger from corrosion would be slight. When it rusts it does not split off in laminæ, but forms on the surface a fine coating of oxide of iron, which, under the action of water, becomes a sort of paint which protects the iron from the further action of rust. Mr. Post did not explain, by the way, why exactly the same change and corresponding protection would not also occur with wrought iron and steel; but even if it should occur, it is evident that such protection would be much less efficacious with wrought iron than with cast, as is proved by the case of the water tank previously cited, in which, though the wrought-iron rods had rusted entirely away, the cast-iron plates forming the sides were hardly affected at all.

Mr. R. H. Robertson also took up the same theme in the discussion, agreeing in the main with Mr. Post, that without great care in the protection of steel-constructed buildings their life would certainly be limited, advising that mere brickwork is not sufficient protection against the infiltration of water and consequent corrosion, but that all external walls protecting iron work should be thoroughly and periodically painted.

Criticism such as the foregoing, when put forward by architects of such high standing as Mr. Post and Mr. Robertson, could not fail to call forth a very animated discussion, especially when addressed to a body including so many architects who had used steel construction to such great extent. Mr. W. L. B. Jenney agreed with all that Mr. Post had said as to their being numerous instances where steel and iron had perished under certain conditions. On the other hand, there is in Chicago to-day a piece of steel which was dug out of old Rome, which is certainly five hundred years old. When the obelisk now in Central Park was moved from Egypt there was found underneath it a piece of iron that dates back perhaps a thousand years. In India there is a column made of lumps of wrought iron, extending about twenty feet into the ground, that has stood there from eight hundred to a thousand years. There are, therefore, plenty of examples of long-enduring, well-behaved steel, as well as of steel that has behaved badly. A number of years ago Mr. Jenney was in Paris at the time of the tearing down of some of the old buildings to make way for modern improvements, and he took particular pains to notice the fine condition of the iron bars which were taken from some of the old buildings where they had been in position hundreds of years without in a single instance evincing any evidence of any more corrosion than would take place in the first week or two while the building was under construction.

Prof. W. H. Burr admitted that it was generally held that cast iron would resist corrosion much better than wrought iron, though he doubted whether the comparison was true as regards steel. He had tested it by imbedding plates of cast and wrought iron in the ground for a period of two years, digging them up from time to time at intervals of several months to observe which had corroded most. At the end of two years he was unable to detect any difference. He cited the case of a railroad bridge near Norfolk, Va., which was supported by cast-iron columns and braced by wrought-iron rods, both columns and rods being partially submerged in salt-water. This construction had existed for about thirty years, and the iron had withstood the action of the elements very satisfactorily. When the bridge was removed, he examined the iron work and found no worse corrosion than a thick coating of rust upon the cast columns, and a somewhat thicker coating upon the wrought-iron rods, but still they had the larger part of their sections intact as good iron. He had also inspected some wrought-iron Phœnix columns which had stood for about twenty-two years as the supports of the platform which held a blast furnace, and had been, during that time, subjected to the action of steam from the water thrown upon the molten metal as it ran from the furnace, being alternately wet and dry, and exposed to the atmosphere under conditions which would be as trying as any which could be imagined. The columns during that period, apparently, had not been painted at all, but he found on the surface of the metal nothing more than a thin coating of rust, perhaps as thick as a thin sheet of paper. The ends of the columns which abutted against castings at top and bottom were rusted to some extent, though not enough to appreciably impair their strength, and the columns could apparently have stood forty or fifty years longer in that exposed condition before any apprehension would need to be felt as to their endurance. Judging from his experience, Prof. Burr could see no ground for naming any definite life for structural steel or iron work. In fact, its endurance, as far as experience goes at the present time, could be considered practically indefinite. The fact could not be questioned, that in some situations corrosion would take place, and take place rapidly, that he had seen for himself, but it was under circumstances which could be easily prevented, and required no more care in the design or in the construction than that which should always be given to other details.

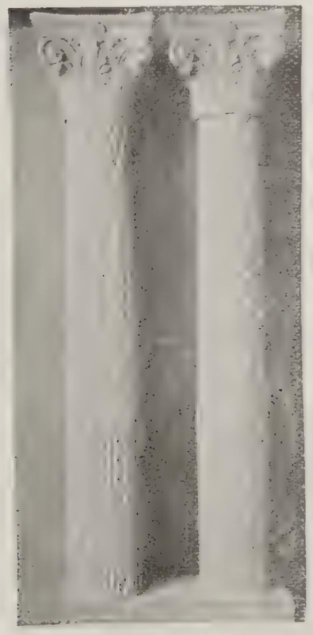
Mr. D. H. Burnham also quoted from his personal experience. A number of years ago when it was proposed to use iron rails for the foundation of a large building, a distinguished civil engineer was asked to make an investigation and give a written opinion. He took some little time, and finally filed his results, among other things citing the fact that he had found during his investigation pieces of steel and wrought iron dug out of Pompeii where they had been imbedded in cement or mortar, showing only a slight scale on the surface, due to oxidation when the pieces were taken out. He had also seen pieces of wrought iron taken from bridge abutments which were forty years old and were apparently in perfectly good condition. And the sum of his recommendation was that it was perfectly safe to use wrought iron in the foundations if it was well covered with cement. Mr. Burnham stated that about ten years after the iron was so used the foundation was uncovered and the metal investigated, when it was found there was a slight scale of oxidation only, probably due to the air which was in the cement close to the iron. He cited, however, the case of the ceiling beams over the engine-room of the Rookery Building, which are under the side alley and are exposed to unusual conditions which would never exist in the cage construction. These beams were taken out a couple of years ago in a bad state of corrosion. Mr. Burnham added that he had repeatedly examined uprights and floor beams with a view to ascertaining whether they were corroded, and where they had been well painted he had never found in any case even the first sign of scaling on the surface. These investigations had only covered a period of four or five years, but he believed the iron or steel would show no more corrosion in ten years than it would in one.

In regard to the substitution of cast iron for steel, while admitting the fact that the former material is less liable to rust, all of the speakers except Mr. Post seemed to be unanimous in a strong distrust in the material itself, due to the difficulty of inspection and the treacherous nature of many castings. Mr. Burr claimed that the experience of engineers with structural materials had led them for the past twelve or fifteen years to exclude cast iron from structural design, except in some special cases where it could be used in large blocks, so that its treacherous qualities would do no harm if they should be developed. Indeed, except in connection with railroad bridge work, which must have wall plates built directly into the masonry to hold the bridge structure, civil engineers will not allow cast iron in their operations, and Prof. Burr stated that it was a matter of great surprise to him and to many of his engineering friends that architects should be willing to use the metal so generously throughout buildings in such members as columns. As showing the liability of cast iron to crack, he cited an instance of some cast-iron weir boxes which were put in place as satisfactory specimens, but after a period of five or six days a crack commenced in one of them, and before that crack had completed its work it had passed entirely across one box, its mate following precisely the same example within a week. He had also seen cast-iron bases, such as were designed and had been used by the hundreds in the elevated railroads of New York and Brooklyn, explode with the noise of a pistol while standing on the platform awaiting shipment, — not in one case alone, but in a number, — and he had also seen them crack after they had been placed. Mr. Jenney said he had very largely abandoned the use of cast iron, owing to some very troublesome experience he had had with air bubbles and honeycombed spots in the castings, which showed no visible signs of their existence and were often almost impossible to detect by even the closest investigation. Mr. Burnham instanced two cases which had decided his practice in regard to cast iron. The first was a heavy cast-iron column for the first story of a tall building, which seemed to be all right, but something caused him to feel that everything was not as it should be, and a workman with a point and a striking hammer was sent to test the surface. He found that the column was honeycombed for three quarters the distance around it, and at least three feet high, so that for at least half of the periphery there was not remaining more than a quarter of the metal area. Its honeycombed spots had been filled with white metal and had been painted over very carefully. At another building a column about ten feet long, two feet in diameter, and with two-inch metal, fell to the street and broke while handling in the delivery wagon, revealing an air chamber three quarters the distance around it and at least two feet long, which was absolutely concealed inside, so that it was doubtful if any one not having an extremely delicate ear could have detected the flaw. Mr. Burnham said that since that time he has never used a cast-iron column, because of the impossibility of making a proper inspection which would discover the air chambers inside the casting. Besides this there is of course the added difficulty of getting a true casting, or one in which the core retains its original position. It is seldom that a perfect cast-iron column is set up. Wrought columns, on the other hand, can be inspected in every joint and every detail,— all of the metal is accessible from the exterior, and there is very little opportunity for any of the hidden defects which make cast iron so unreliable.

In conclusion, the discussion, animated and complete as it was, really decided very little except as matters of experience. We know that iron and steel will rust under some conditions. Fortunately we may also assume, on the evidence of the gentlemen quoted above, that the liability of dangerous corrosion is very slight if the metal is properly protected. One of the tallest buildings in New York is constructed with cast-iron columns in the lower portion and wrought steel above, but the architect informed the writer that his experience would not lead him to use cast iron another time. Theoretically, cast iron is preferable. Practically, on account of its joints, the difficulty of making proper connections and the liability to break from a sudden shock, to say nothing of the impossibility of getting absolutely true castings, it seems generally to be discarded. It must be remembered in considering any question of this sort that the quality of steel has improved a great deal within the last few years, so that to-day the architect can depend upon the quality of the material he receives as being reasonably pure and homogeneous, whereas in the early stages of their manufacture steel beams would often break even more treacherously than cast-iron columns. Wrought iron is supposed to be the pure metal. Steel contains a small proportion and cast iron a larger proportion of carbon. Whether the presence of the carbon in the metal acts as a retardant of the corrosion it is impossible at this time to state; but however steel may fail in some cases, there certainly seems to have been adduced unquestioned testimony to the life of the material as ordinarily used in building construction.

C. H. BLACKALL.

[The foregoing article covers a subject inseparable from modern fireproofing. Its natural place is in the department on "Fireproofing," but lack of space there and the importance of the paper lead us to publish it as the leading article for this month. — ED.]



ONE of the special features of the American Theatre in New York City is the roof garden, which is treated in a very pleasing manner with considerable rich detail in terra-cotta. The two columns here given are used in this part of the theatre. They are the work of the New York Architectural Terra-Cotta Co., who have furnished us with several other details from this building, some of which were published last month, and others will be found elsewhere in this issue, and in the December number. The architect is Mr. Charles C. Haight, of New York City.

ARRANGEMENTS are now being made with an architect about to spend the winter in Italy, by which we expect to secure for publication next year a series of twelve plates of measured drawings of brick details that have never been published.

BRICK AND MARBLE IN THE MIDDLE AGES.

CHAPTER VII. — CONTINUED.

G. EDMUND STREET.

> "And whither journeying? To the holy shrine
> Of Saint Antonio in the city of Padua."
>
> *Rogers.*

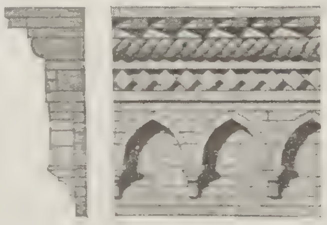
NEIGHBORHOOD OF VERONA — VICENZA: CATHEDRAL — SAN LORENZO — SANTA CORONA — PALAZZO DELLE RAGIONE — GOTHIC PALACES — PALLADIO'S WORKS — TEATRO OLYMPICO.

MANY of the villages near Verona are remarkable for the remains of castles of the Middle Ages. I have never, however, been able to find time for the examination of any of them, and, judging from hurried views which I have had of three or four castles south of Verona, I suspect that they would scarcely repay a long *détour;* they seem generally to be more remarkable for their general contour, and their quaint forked battlements, than for any of that delicate detail and appliance to ordinary wants which it was especially my object to see and study.

The railroad from Verona to Vicenza and Padua is not interesting; the country is beautiful and luxuriant in detail, but rather tame, flat, and over-green in the general view. The Veronese mountains, however, are in view on the north, and as one approaches Vicenza the hills throw out their spurs into the flat country, covered with vineyards, orchards, and fruit trees; village follows close upon village, each with its white church and white campanile, contrasting strangely with the rich color above and around, and at last the towers and roofs of Vicenza are descried on our left.

And is it possible, my readers will exclaim, that you, an architect, can have dared to pass within sight of Vicenza without making long sojourn there to drink in the lessons which the works of your great master Palladio are there to instil! Even so, reader; for in this world there are unhappily two views of art, two schools of artists, — armies of men fighting against each other; the one numerous, working with the traditions and rules of their masters in the art, exclusive in their views, narrow in their practice, and conventional in all their proceedings, to the most painful forgetfulness of reality either in construction or in ornament; the other young and earnest, fighting for truth, small in numbers, disciples of nature, revivers of an art to all appearance but now all but defunct, yet already rising gloriously above the traditional rules of three centuries. The one class representing no new idea, breathing no new thought, faithful to no religious rule; the other rapidly endeavoring to strike out paths for themselves as yet untrodden, gathering thoughts from nature, life from an intense desire for reality and practical character, faithful moreover to a religious belief, whose propagation will be forever the great touchstone of their work. The one class, the disciples of Palladio, journeying toward Vicenza with a show of reverence to learn how he built palaces of compo with cornices of lath and plaster, already in two short centuries falling to decay, wretched and ruinous! the other stopping long at Verona, dreaming over the everlasting art of the monuments of the Scaligers, and of the nave of Sta. Anastasia, still, though five centuries have passed with all their storms about their heads, fresh and beautiful as ever, fit objects of veneration for the artist in all ages.

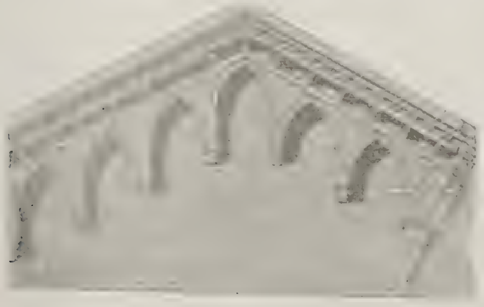
A disciple, therefore, of the last of these two schools, I stayed not longer at Vicenza than was necessary to satisfy myself of the truth of the charges against Palladio's work there, and to note the few, but interesting, mediæval remains. The situation of the city is beautiful. Near it to the north are mountain ranges, and where these descend into the plains there are smaller hills covered everywhere with luxurious vegetation. The first view of it is also very fine. In front is the old brick tower at the Porta di Castello, with its deep brick machicoulis sloping boldly outwards, and finished with a square battlement under a flat roof. Beyond this are seen the steeples of the city, and highest among them the Torre dell' Orologio, a tall, slender brick tower in the Piazza dei Signori, in the centre of the town. The most important Gothic churches are the Cathedral, San Lorenzo, and Santa Corona. They seem all to be in very much the same style — one derived no doubt from Venice, as we shall see when we arrive there. The plans usually are of this kind. The bays of the nave are square in plan, those of the aisles oblong in the direction of the length of the church, the choirs apsidal, and the chapels on each side of them also apsidal, but with an equal number of sides, so that there is an angle in the centre. The transepts are square ended, the sacristy at the end of one of them, and the tower at the side of the chancel aisles. The Cathedral departs from the type of plan just mentioned, but is, I think, the only exception to the rule. It has a very wide nave without aisles some fifty-five or sixty feet in the clear, but it has been so much repaired and altered that it is now very uninteresting. Good effect is obtained by the very great elevation of the altar, which is raised above a crypt, the entrance to which is by flights of steps on each side of the steps which lead up to the choir. The exterior is mainly of brick save at the west end, which has an arcade of stone with a doorway in the centre division.

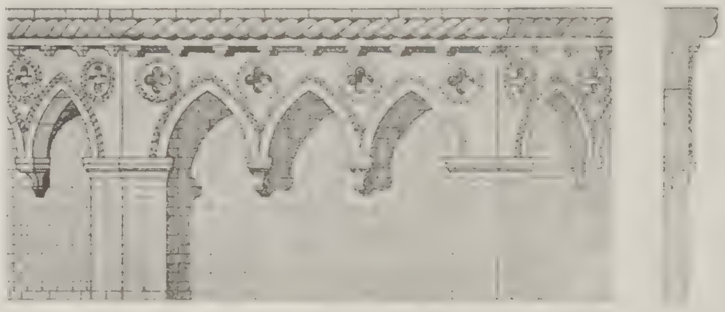


This kind of west front is repeated in the more interesting church of San Lorenzo, which is finished with one vast gable in front of nave and aisles, and has for its lower stage an arcade of seven divisions, with a fine pointed doorway occupying the three central arches. This part of the front is mainly of stone, with enriched members around the arches in brick, and it is divided from the upper stage by a corbel-table. The gable is of brick with a large stone circular window in the centre, and five smaller circular windows following the line of the flat gable which crowns the whole. I was not much impressed by this design, the only virtue of which is a certain amount of simplicity and breadth.

The interior of San Lorenzo is lofty and spacious. The nave and aisles alone measure about one hundred and fifty feet by ninety, and there are spacious transepts, choir, and chapels. The columns are circular, and have capitals so badly carved that it is somewhat difficult to say whether they have shells or tufts of foliage for enrichment. Very small circular windows in the clerestory, and a groined roof, complete the design. The best portion of the exterior is, I think, the elevation of the bays of the nave aisles. Here there are two simple trefoiled lancets with a shallow buttress between them, and a circular window above in each bay. This design is refreshingly pure and simple. The steeple is on the east side of the north transept. It is of six stages in height, the stages being marked by slightly sunk panels, and corbel-tables under stringcourses, which are formed by a pattern in the bricks, not by any projecting moulding, so that the straight outline of the steeple is not broken. The result is not particularly good.

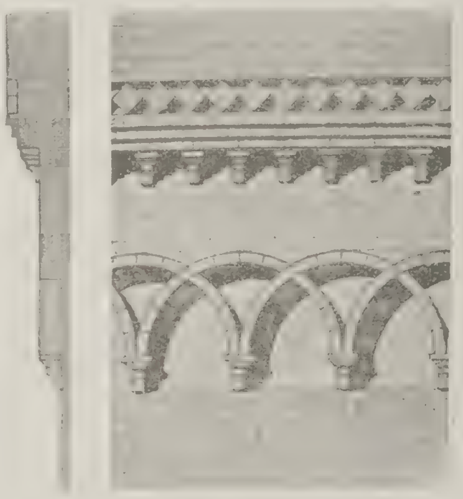
Santa Corona has, like the other churches, a single gable in front of the nave and aisles, with a western doorway and a large circular window above. I have a recollection of it as of one of the most ungainly of fronts. The campanile here is much like that of San Lorenzo, but has a low octagonal belfry-stage finished with a small circular brick spire. Santa Corona may well be more visited for a picture by John Bellini than for its own merits. This is a picture over one of the altars in the north aisle representing the baptism of our Lord, — one so quiet and beautiful in color, so dignified and solemn in its design, that it is impossible to admire it too much. Behind the group of angels who hold our Lord's garments is a mountain landscape such as one sees from Vicenza. It is a sublime work. The marble reredos is coeval with the picture: it is furnished with two low screen walls right and left of the altar, a common and proper arrangement for its protection when, as here, the altar stands in the aisle itself and not in a chapel.



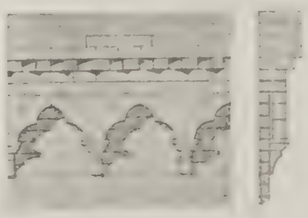


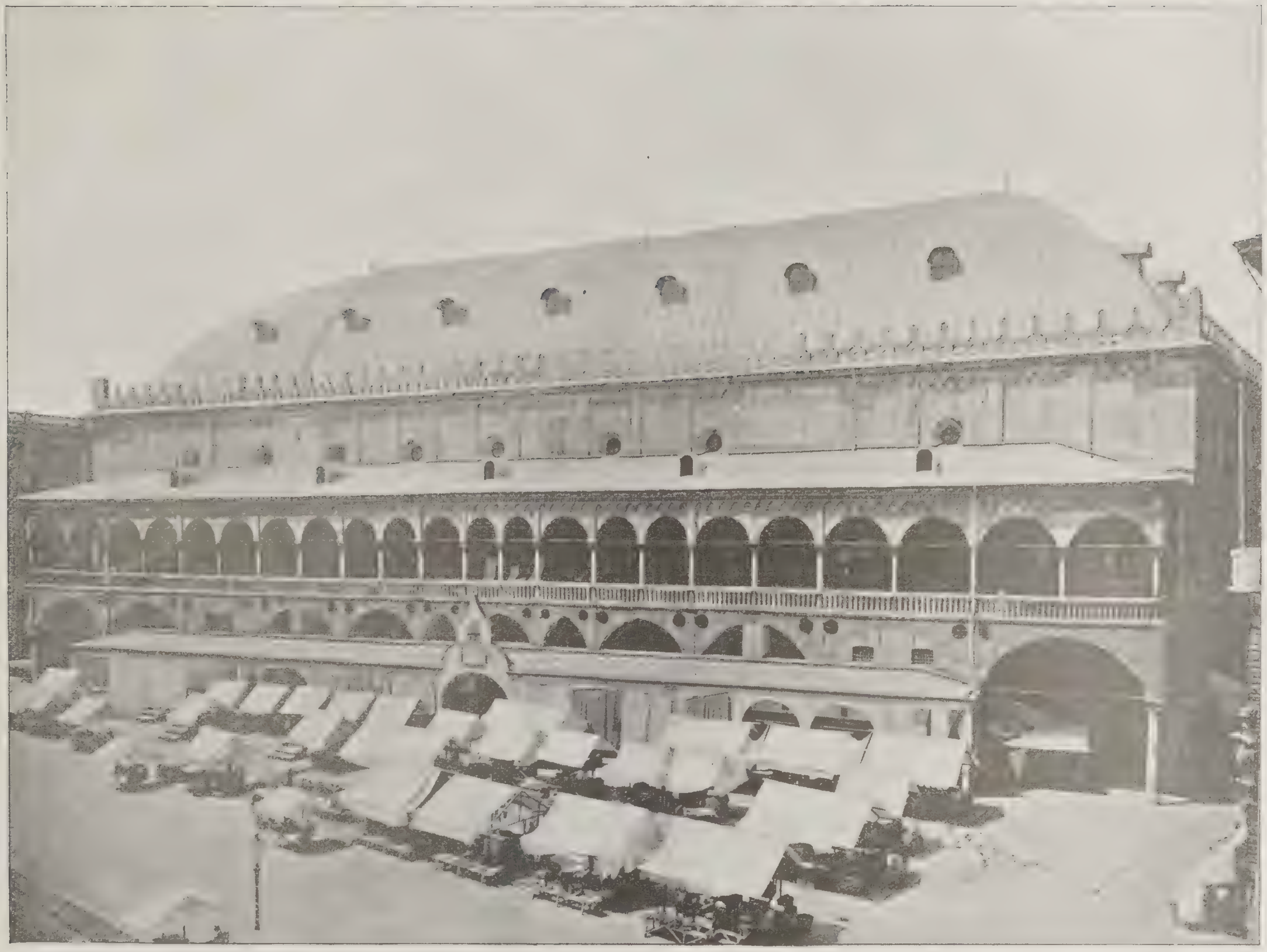
I did not find any other church worth noticing, and soon made my way to the Palazzo delle Ragione. The great feature of this building is the enormous hall, no less than seventy-two feet wide inside, and covered with a great arched timber roof boarded on the under side, and divided into vertical panels by bold ribs painted black and white. This roof is held together by two tiers of iron ties, and, being arched and boarded at the end as well as at the sides, has somewhat the look of the inverted hull of a great ship. The effect is imposing, though at the same time it is somewhat gloomy, owing to the absence of all high light.

This great hall was Gothic inside and out until Palladio cased the front with open arcades, standing out from the walls and entirely concealing from below the old windows. These were large single lights with moulded jambs, but not of very good style. The original staircase remains, with good marble shafted balustrades. The old work here is said to have been done before the year 1444, the hall having been burnt in 1389. This date is of some importance, as the walls of the upper portion are faced like the upper stage of the Ducal Palace at Venice, — with marble arrangement in a diaper.



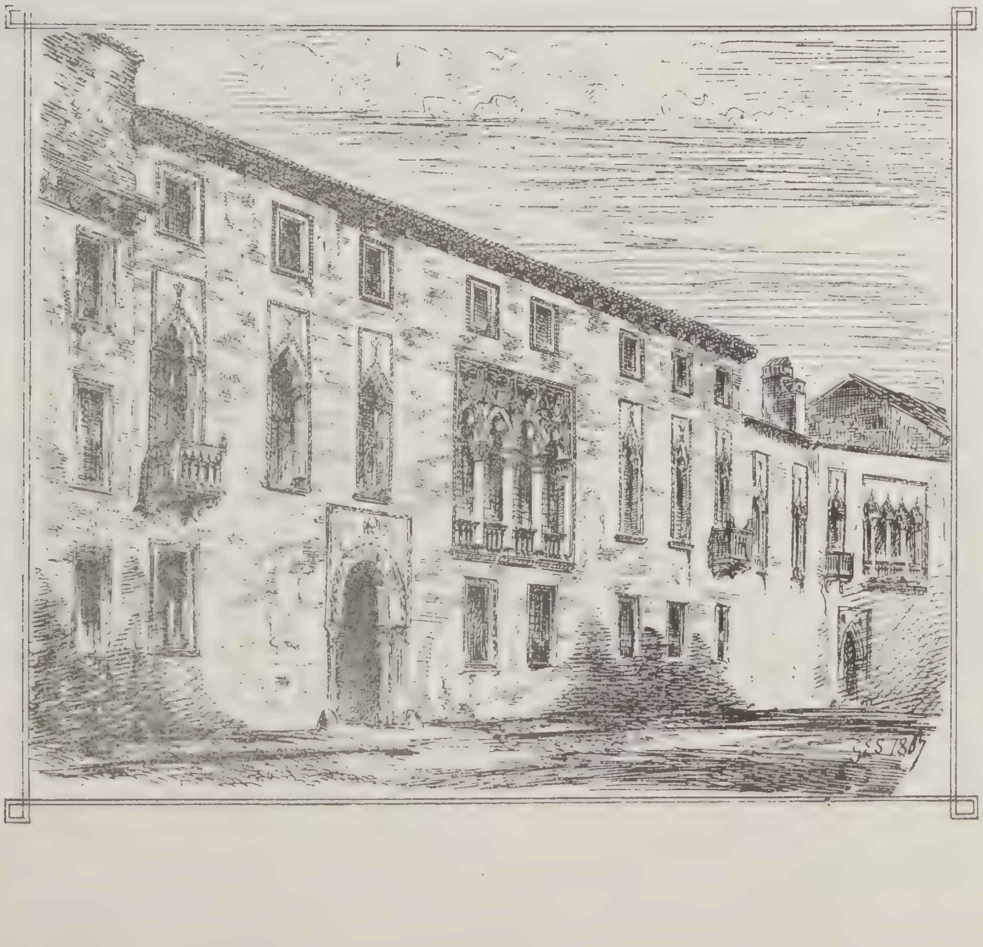
The slender and lofty tower of brick which rises at one end of the building, the two Venetian columns (Vicenza became subject to Venice in 1404), and the Palazzo itself, in spite of its small architectural merit, combine to make a charming picture, rendered more beautiful, when I saw it, by the animated crowd of peasants who filled the piazza. The streets here are very picturesque, rather in spite of Palladio and Scamozzi than in consequence of what they did. Some of them are arcaded, and the Gothic houses are still very numerous. They are all, however, of late date — at least I saw none earlier than





PALAZZO DELLE RAGIONE, PADUA, ITALY.

Supplementary Illustration to "Brick and Marble in the Middle Ages."



about 1350. They are of the same design as some of the well-known Venetian palaces, only here they rise out of narrow streets, instead of, as they do there, from the water. The usual arrangement is to have on the ground floor a single doorway, not necessarily central, and on the piano nobile a fine traceried window with balconies in the centre, single windows also with balconies near the angles, and intermediate windows of the same design but without balconies. These are always treated in the same way with small shafts, and with animals seated on their angles, and are supported on bold corbels. All the carving that I saw was weak and confused in outline, and poor in detail, and the capitals are generally too large for the arch mouldings which rest on them — a common fault in Italian Gothic work.

I give a view in the Contrada Porto, which illustrates two of the best of these houses. Almost the whole of this street happens to consist of houses of the same age, and one of them has on one side of its internal courtyard open arcades on each story, the upper one having its balustrades remaining between the columns, similar in design to those in window balconies.

In their original state most of these houses seem to have been left in red brick, the windows being of stone, with thin white marble slabs fitted into the spandrels above the arches. Projecting balls of marble are often fixed in front of this marble lining. Some houses seem, however, to have been plastered almost from the first with a view to painting, and I can hardly say a word against such a plan, with the recollection of the glowing — in spite of their being faded — tints which one still sees at Brescia, Genoa, and elsewhere in Italy. But where the house has architectural features which are at all good of their kind, the painter is very apt to ignore them entirely in his work, so that what was meant to be a good piece of architectural work becomes in the end a badly cut-up ground for a painting. Where there is no architectural detail to be spoilt, any amount of painting may be lavished on an external wall; and I know few examples which better show with how much good effect it may be done than the great house of the Fugger family, in Augsburg, which many Italian tourists nowadays may see and admire on their way to or from Italy. The other objection to external painting is its evanescent character; but good color is beautiful even in its decay, and I suppose the best artist will paint what will do most good to his own generation, and trust to his successors for doing as much for their own times!

One of the most fanciful houses in Vicenza is the Casa Rigafetta, below the Palazzo Pubblico. The ornaments are not pure, and there is too much straining to make the most of an opportunity by putting everything possible into a small space, but still the whole is decidedly pretty. The balconies here are in plan half a quatrefoil. Near this house is one with carved angle-shafts, a feature which I do not remember to have seen in Venice.

Palladio's works are supposed now to be the glory of Vicenza. I cannot forgive the artist who did not care to give solidity to his work, and the power of executing a vast amount of enrichment in the cheapest way, and with the commonest materials, is about the greatest snare into which an architect can allow himself to fall. I am well aware that Palladio was not the inventor of trumpery modes of construction. His admirers might quote the architects of Pompeii, fifteen hundred years before him, as offenders in the same way, and the curious preservation of their works as the justification of their offence; but Palladio followed after men of his own kind and craft who for centuries had studiously endeavored to do their work honestly, and he deserves, therefore, all the hostile criticism of those who object to a revival of bad practices which in our own day and country have done more real damage to architecture than anything else that can be named.

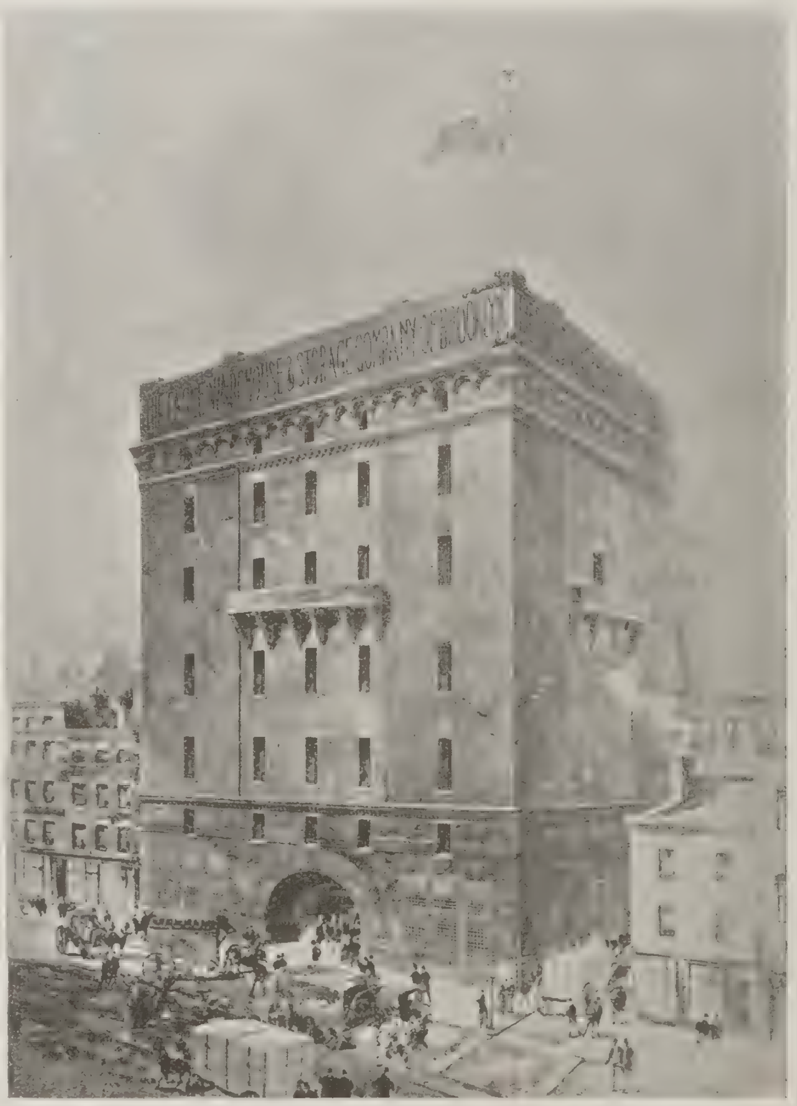
One only of Palladio's works interested me, and this rather as a curious experiment than as a work of art. This is the Teatro Olympico, a famous open-air theatre. There is, first of all, a semicircular auditorium open to the sky, and only remarkable for a mean arrangement of pilasters at the back. The great object of interest is the stage, on which a permanent scene has been constructed by Palladio. In order to make this look much larger than it really is, the streets, palaces, and temples which are represented are built in perspective. To accomplish this the stage rises very rapidly, the buildings are squeezed up and built in sharp perspective, so that in the end a triumphal arch, which is really forty feet from the front, looks as if it were four hundred. Should an actor, by any chance, so far forget himself as to walk into what looks like a practicable street, in a minute he would find himself able to shake hands with the statue on the top of the arch, the illusion would be entirely destroyed, and the scenery would all look like a collection of dolls' houses. As an ingenious deception from one point of view, and under certain conditions, the scheme is successful, and probably this is as much as Palladio himself would have claimed for it.

We had now seen all that we cared to see in Vicenza, and gladly found ourselves again *en route*. There was nothing to see on the road, and we were not sorry when our engine gave token by its whistle of our approach to Padua. The omnibus discharged us in a few minutes at the hospitable doors of the Stella d' Oro, and we were soon out again, with the view of making the most of our time.

(*To be continued.*)

[For supplementary illustrations to the foregoing article this month we have taken five details from Prof. Heinrich Strach's admirable work on the brick and terra-cotta of Italy. Every architect should possess this valuable book. It is published in Berlin, at 100 marks. We will secure copies and deliver them to any address in the United States, express paid, for $33.00. For particulars as to contents and scope of the work addess the editor of THE BRICKBUILDER.]

THE rise of Messrs. Fredenburg & Lounsbury to a position of prominence in the New York material market has been as rapid as it is deserved. By constant application to business on business principles, this young concern has taken its place among the leading brick manufacturers' agents in the New York district. Foremost to recognize their ability was Mr. H. E. Mack, general manager of the Eastern Hydraulic-Press Brick Company, and, as a result, Messrs. Fredenburg & Lounsbury have been installed in the offices of this company, Metropolitan Building, New York, as selling agents for New York and the New England States.



EAGLE STORAGE WAREHOUSE, FULTON STREET, BROOKLYN.

FRANK FREEMAN, Architect. P. J. CARLIN & Co., Builders.

Laid up in Clinton Hematite Red Mortar Color, made by the Clinton Metallic Paint Co., Clinton, N. Y.

THE ART OF BUILDING AMONG THE ROMANS.

Translated from the French of Auguste Choisy by

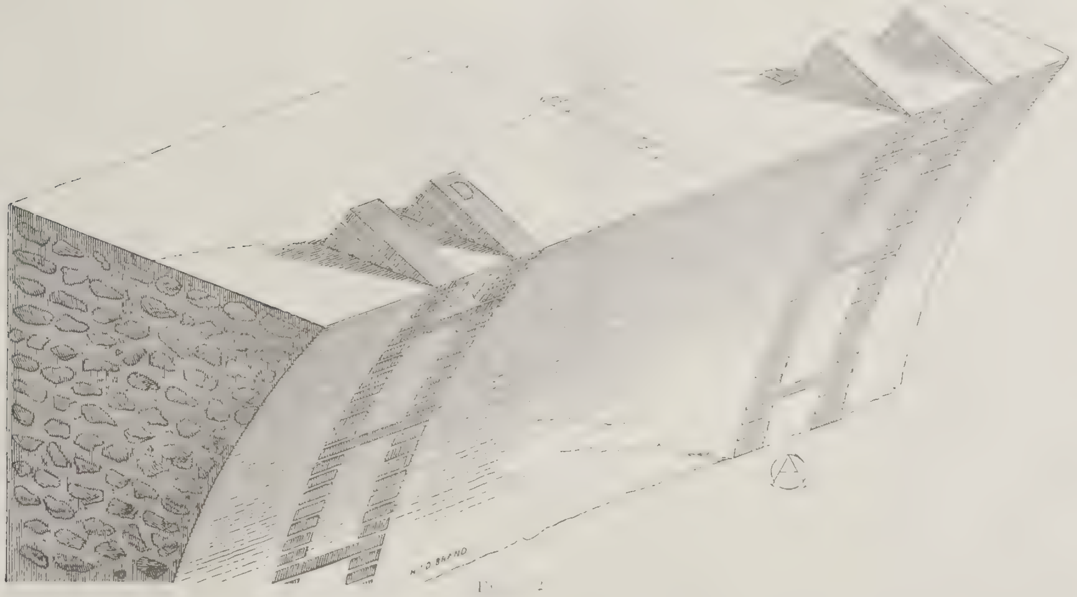
Arthur J. Dillon.

CHAPTER II. — Continued.

I.

VAULTS WITH ARMATURES WITH RADIATING JOINTS.

One can understand that the brick armature of the Palatine (Plate I.) would serve as a centre during the construction of the vault, for it is a continuous network withstanding a constant force; nothing is simpler. Even in the aqueduct of Nero, where the arches are quite close to each other, and where the large square bricks nearly span the intervening space, it can be seen that the brick skeleton is capable of carrying the greater part of the weight of the rubble while the vault is in course of construction. But, it may be asked, is it the same when the armature is reduced to a system of engaged double arches, to a series of rings, not only distinct from each other, but also separated by a distance of almost three metres? Does it not seem that the arches will hold up only the rubble directly over them, and that the still semi-fluid mass between each arch and the next one will bear directly on the covering of the wooden centring? Such is the difficulty, but the following, I believe, is the solution.



Let us take (Fig. 22) a vault built on ribs cut by a horizontal plane, or, in other terms, such a vault interrupted in the course of construction, and let D and E be the sustaining ribs. It is evident that the two ribs would suffice to support the mass of the vault, whatever the interval between them, if the horizontal courses of this mass were bounded not by the right line N A R, but by the curve D B E, and this would be true no matter how irregular were the rough fragments composing the horizontal courses, if the curves, such as D B E, were given a sufficient crowning A B. Thus each course of the rubble can be imagined as being composed of two parts, of which one, lying outside of a certain imaginary curve, D B E, will sustain itself as though it were a sort of horizontal arch with radiating joints abutting on the ribs D and E. The other part S comprised between the curve D B E and the intrados will be suspended from the first portion, stuck to it, as it were, by that commencement of adherence which mortar has at the instant it is laid.

This explanation does away with the objections that might be raised against the use of the discontinuous armatures, and at the same time explains the slightness and irregularity of the pieces of wood which the Romans used for the lattice of the centring, even when the brick ribs were very widely spaced. These pieces, whose form is shown by the imprints they left, were long thin boards, ordinarily with many flaws, and placed in a haphazard way on the principals of the centring. Their *rôle* was not so much to sustain the rubble as to form a mould for it; at the most they had to sustain, and only until the mortar set, the insignificant weight of that part of the whole mass marked "S" in the preceding figure. The same system of insolated ribs is to be found on a larger scale in the Basilica of Constantine. We have been considering vaults over galleries of perhaps five metres in breadth, but here the vaults have a diameter of more than twenty-three metres, which is almost the width of the nave of St. Peter's at Rome.

Vaults of such a size require supports of exceptional strength, and the architect, fearing no doubt that single arches such as those of the Coliseum would be insufficient, reinforced them with similar ones, so that the support is composed of two interlocking arches of brick one over the other (Plate III. and Fig. 24). This manner of doubling the armature in order to make its strength proportionate to the span of the vault seems quite natural, but it might be questioned whether it would not have been preferable in place of superimposing the arches than to have placed them side by side, taking the precautions to securely tie them together. This would have more completely reverted the intrados of the vault and at the same time increased the base and stability of the ribs without requiring a greater number of bricks; but this arrangement, immaterial in regard to the number of bricks, was quite the contrary in regard to the expense of the temporary centring. When the two arches interlocked and were superimposed, as in the Basilica of Constantine, only the first needed to be supported on centres; once in place, the first arch served as the centring for the second one which surrounded it; if, on the other hand, the two arches had been built side by side instead of superimposed, they would have borne on the centres at the same time and, as they would be practically of the same weight, the strength of the temporary work would have to be doubled. Hence, considering economy of temporary work, it was more advantageous to do as the Romans did, and strengthen the rib by placing the second arch over the first.

But it still remains to be seen whether the economy in the temporary work was not partly balanced by the risks of buckling.

It is certain that an arch twenty-three metres in diameter and but sixty centimetres between the faces could not have its centring removed without buckling and falling in ruins. But the strength to be given to the armature of a rubble vault is not to be calculated under the condition that it is to support itself and an additional load the moment it is completed, for its strength at this moment is of little importance provided that at the instant the rubble commences to weigh upon it, it can withstand the compressive forces and the causes of buckling. Regarding the question in this light, which is the only true one, it is evident that an arch of only sixty centimetres from face to face is amply sufficient; for in the first place, during the entire period when the mass of the vault does not bear on the centres, the armature is clearly in no danger, braced as it is by the wood intended for the moulds of the octagonal cushions (Plate III., Fig 25), and secondly, when the pressure does commence to come into play it does so progressively, increasing at first quite slowly, and at a greater rate as the mass approaches the summit. When the pressure commences to be felt the real span (A B, Fig. 23) of the arch is already much smaller than the diameter of the barrel vault, and as the rubble is laid the real span of the arch is continually reduced to the portion not buried in the mass. Thus it can be seen that the resistance of the armature increases with the forces it has to withstand; and when the still wet mass of rubble reaches such proportions that its weight upon the ribs becomes considerable, the span of the arch is so much reduced that it is quite capable of resisting the pressure. In a word, the solidity of the ribs and their resistance to buckling tendencies increases as the opening A B decreases, that is, as strength is more necessary. We can thus understand how it was possible to use such thin arches as supports in building one of the most colossal vaults that the ancients ever raised: and the feat is surely one of the most remarkable results of the long experience of the Roman builders.

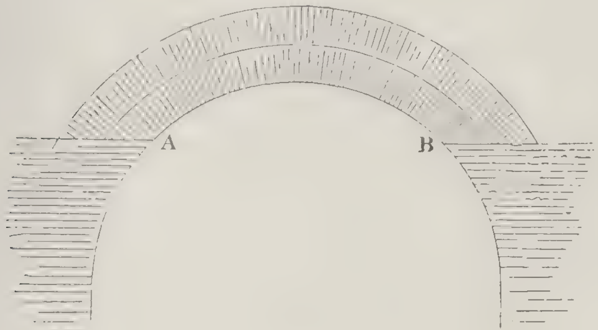


Fig 23.

The construction of the vault may be irreproachable, but it must be acknowledged that the compartments with which it is decorated have but slight relation to the ribs with which it was constructed. I give the detail on a large scale (Figs. 24 and 25) of a portion of the ribs of the Basilica of Constantine.

The figure at the left shows a bored rib, that to the right a rib still buried in the filling, and, as can be seen, the ribs follow the salient sides of the larger octagonal caissons. Thus far their position is happily chosen, but the architects who decorated the edifice wished to fill the spaces between the large octagonal caissons with small square ones, and the builder, bending to this fancy, was compelled to cut into the ribs to a depth equal to that of the square caissons which they crossed (Fig. 25). The lack of accordance between the structure and the decoration was hidden by an expedient which at first glance may appear strange, but which, I think, should not be too severely condemned from the point of view of art. To put the form of an edifice in direct opposition to the fundamental principles of its construction, to hide the frame, which plays an important part in the equilibrium of its masses, would be to present to the eye something which the mind could not accept, would be to be lacking in taste by offending the intellect by presenting to it an evident falsehood.

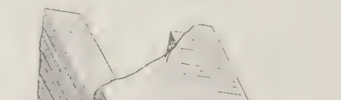


Fig. 24.

But I do not think we would be justified in saying that in covering the armature of brick that the Romans were concealing from the spectator one of the essential parts of the structure. The armature of a Roman vault was but a simple expedient of the work yards. It was useful during the construction; it was an auxiliary to the raising of the vault, but it lost its value and its *rôle* as the masses were consolidated; and when finally the mortar was firmly set it ceased to have an individual existence and became an integral part of the vault itself. From this moment the Roman architect no longer saw either filling or frame, but considered the whole as a concrete mass, and he may well be excused for not expressing in the decoration a distinction which, in his eyes, no longer existed in the structure.

Hence the cases where the ancients put the skeletons of their vaults in evidence are extremely rare. I can cite as an example of vaults where there exists a perfect concordance between the armature and the decoration only the vault of the double temple of Venus and of Rome. Unfortunately the upper part of this remarkable vault has been entirely destroyed, and the vestiges of the lower part which still remain are so incomplete and so fragmentary that a great part of its restoration must be theoretical; therefore the details of its construction, which an examination of the ruins seemed to me to make clear, and which I show in Fig. 26, are not given as certain, though they are quite probable.

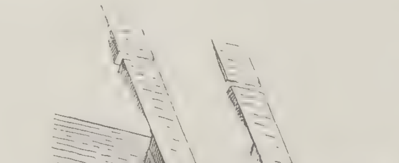


Fig. 25.

The caissons were square, and the ribs of the armature corresponded with the uninterrupted ridges between them, lying in planes parallel or perpendicular to the axis of the vault, the whole forming a network of large meshes whose sides followed the generators and lines of right section of the vault.

The dimension along the generators of the vault is not so great in these ribs as in those of the Basilica of Constantine, but the ribs are quite solid, instead of being of openwork, like those of the greater part of the Roman edifices.

The manner of making these frames of brick, these salient ribs which show in relief in the intrados, needs no explanation. As shown in the sketch, the ribs of brick and the form (probably of wood) which served as a mould formed, before the building of the mass of the vault, a solid whole. The horizontal members braced the transverse arches and, kept in place by the moulds for the caissons, together formed between the centring and the filling a slight vault, partly of masonry, partly of wood, which had a *rôle* analogous to that of the continuous network of brick shown in the first plate. Here we find an exact concordance between the structure and the form; the architect has incidentally used the members of brick ornamentally, but he was in no way bound to do so, from the point of view of art, and the concordance in the vaults of the temple of Venus and of Rome does not seem to me to be of sufficient importance to give any decided superiority to this edifice.

We have reviewed the principal types of armatures with radiating joints; if now a view is taken of their applications as a whole, one will appreciate, with no further explanations, both the services which they rendered and the guarantees of success which they gave during the construction of the vaults. But it may be asked, aside from these advantages, was it not to be feared that their use involved some dangers? Would not these courses buried in the thickness of the vault form an incompressible core in the still wet rubble? enclosed in masonry which would shrink, might they not hinder its movements and cause cracks or fissures? If this had really been the case, the armature which facilitated the building of the vaults would have hastened or perhaps prepared their ruin. But happily the case was quite different; the vaults were not masses cast in a single piece, and the general progression of the construction in courses greatly reduced the danger of contraction; each course quickly reached its final volume, the shrinkage took place course by course, and movements of the whole mass being thus avoided there was less danger of fracture. This applies not only to the armatures we have just described but, without the necessity of recurring to it later, it will be found to be equally true of the new kind which we are about to take up.

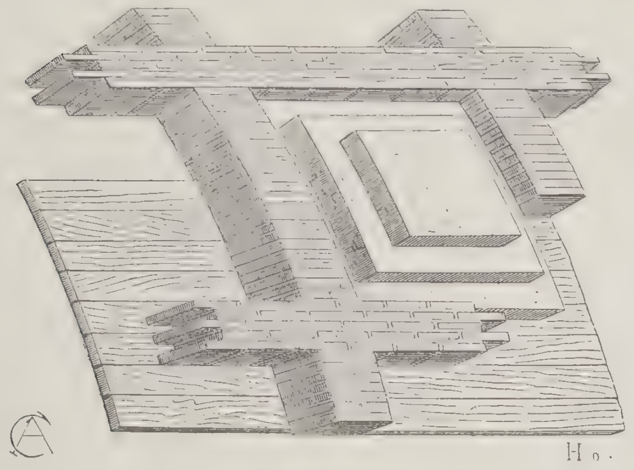


Fig. 26.

(*To be continued.*)

OUR ILLUSTRATED ADVERTISEMENTS.

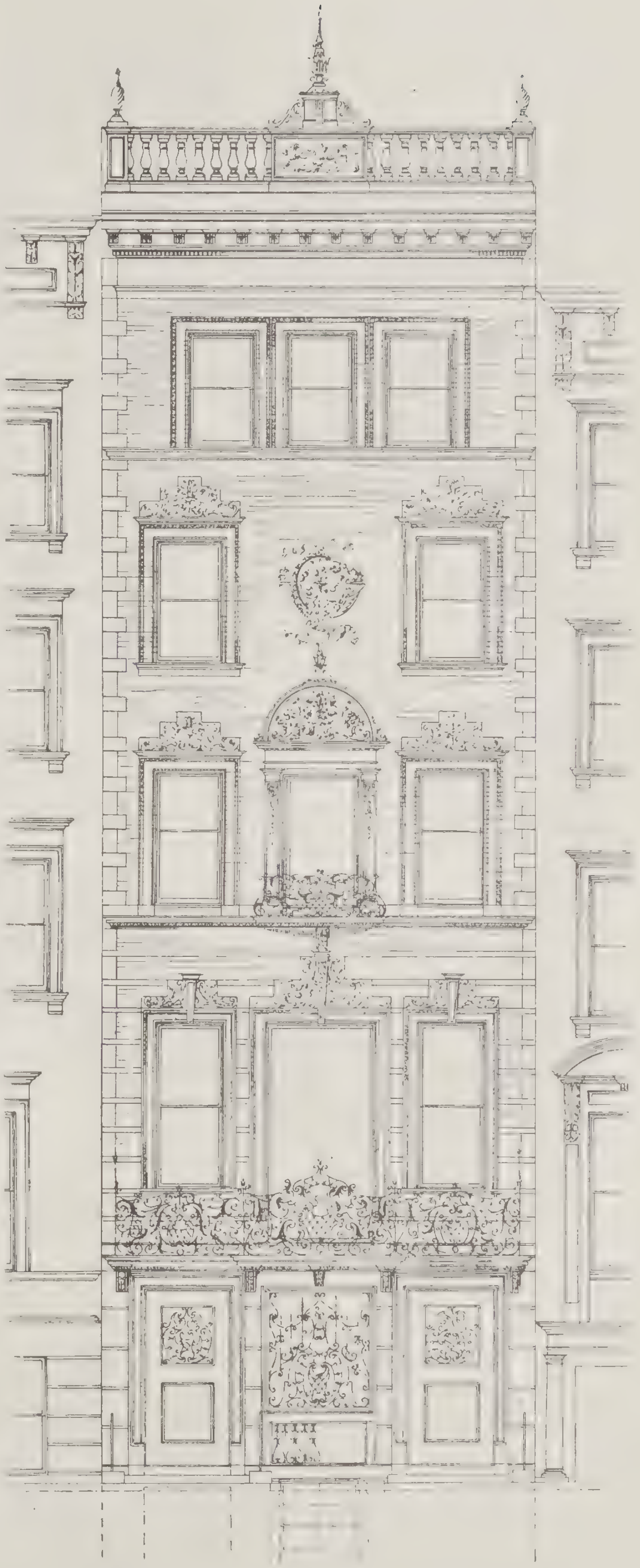
SAN GIORGIO IN VELABRO

Is number two of the Hydraulic-Press Brick Series (see page vii). It was founded in the fourth century, rebuilt in the seventh, and the portico was added in the thirteenth.

At the base of the tower is seen the arch of the Silversmiths. Our readers, by referring to the same advertisement last month, will see how closely similar this tower is to that of S. Maria in Cosmedin. In this connection let us state that we have completed arrangements for our heretofore announced article upon the Brick Towers of Rome, only our scheme has grown to cover all Italy. It is with greater pleasure that we announce the writer of the series of articles,— Mr. C. Howard Walker, of Boston,— who needs no introduction from us, to architectural readers.

MADONNA AND CHILD.

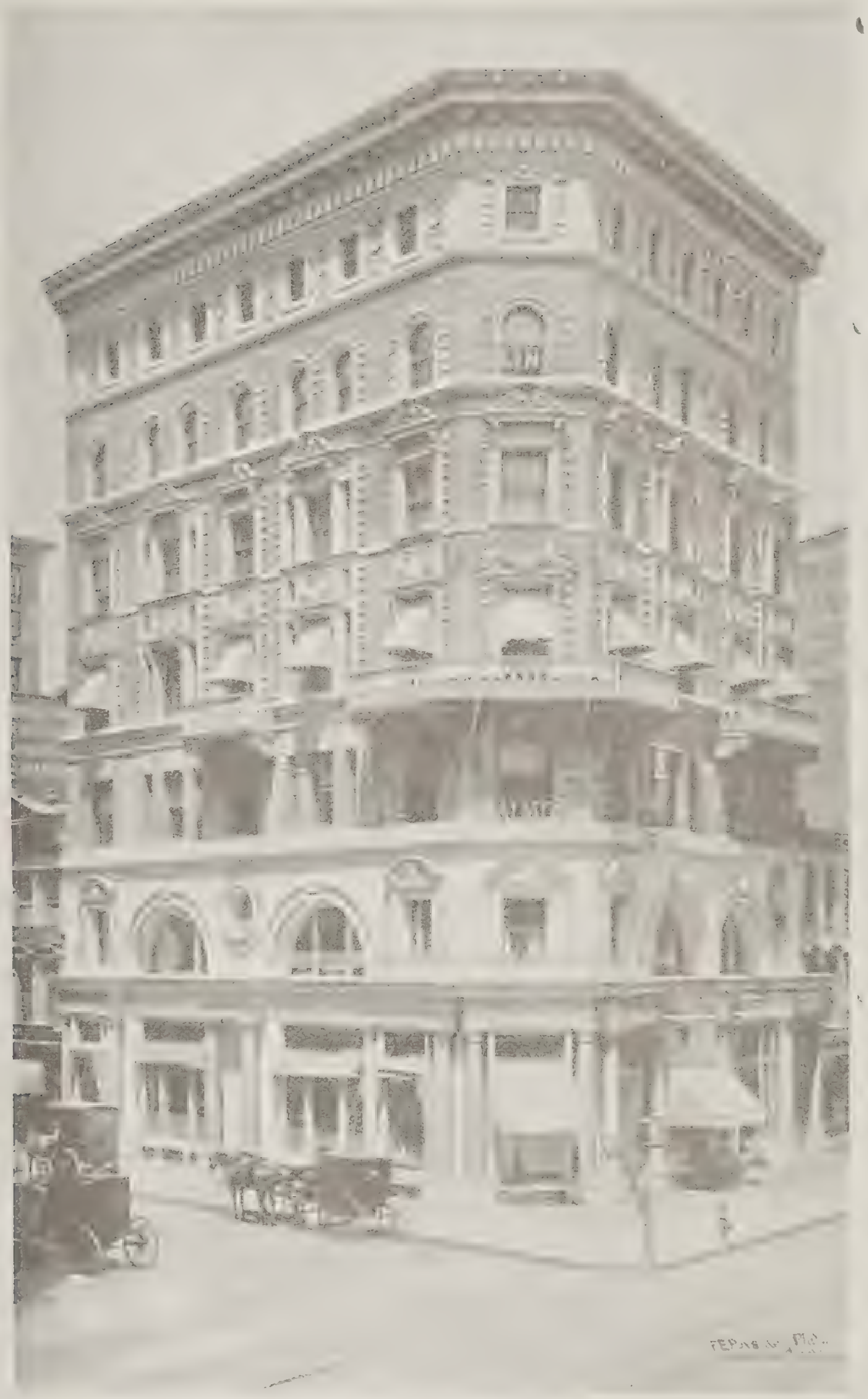
The Atwood Faience Co., of Hartford, Conn., have joined the movement started by the Hydraulic-Press Brick Companies, and their advertisement is to be watched each issue. A series of reproductions of the Della Robbia work will be presented. The initial one, on page xv. is a tympanum that crowns a door in the Via dell' Agnolo, Florence. It is one of the finest of Luca della Robbia's works. The background is blue, the figures white, the floral motive in the archivolt is in colors.



HOUSE FOR J. W. HENNING, ESQ., NEW YORK.

James Brown Lord, Architect.

This elevation was crowded out of the September number, in which were published a scale detail of the upper portion and a photograph of the front. The elevation above is reproduced at a scale of one eighth of an inch.



THE WARREN BUILDING, NEW YORK.

McKim, Mead & White, Architects.

This building, located on the corner of Broadway and 20th Street, is one of the earlier buildings in light brick and terra-cotta. These materials were made by the Perth Amboy Terra-Cotta Co. It is thoroughly fireproof, the contract for this work going to the Raritan Hollow and Porous Brick Co., of New York. Messrs. M. Reid & Co. were the general contractors. Dyckerhoff, Portland, and Brooklyn Bridge brand Rosendale cements were used in the construction.

THE terra-cotta work in the new Tremont Temple, Boston, is well along, and as soon as the steel work is ready, which has been the reason of delay, the building will be rapidly pushed forward. This terra-cotta is some of the best work the Perth Amboy Company has turned out, and is very beautifully modelled. As an instance of the care bestowed on the details, this little terminal to the balcony floor arches is published.

TRADE PUBLICATIONS.

WE are, perhaps, a little late in the acknowledgment of the new catalogue of the Hydraulic-Press Brick Company. However, it is in its way such a masterpiece that we feel that it will not even now be amiss to make some short review of what it contains. The form in which it is issued is a most excellent one. All the illustrations are printed on separate sheets of heavy card texture, and enclosed in a substantial leather case, permitting the extraction of any particular sheet or sheets for such use as may be required without disturbance of the others. The first sheet of matter contains a table of brick measurements that were obtained by actual measurement of over one hundred different buildings built of their brick. The value of these tables is self-apparent. Following this are some sixty sheets of outline of moulded bricks, the cuts being the exact size of each brick represented. This last is supplemented by nine sheets of fine illustrations, some dozen to a sheet, of designs of moulded brick of particularly artistic patterns, also ten of illustrations of different styles of enamel brick.

WE wish to acknowledge a very handsome little booklet, entitled "Seen in a Golden Light," issued by The Platt Pressed Brick Company, of Des Moines, Ia. The originality and taste of this vest-pocket catalogue warrant it receiving attention wherever sent. On the first page is a cut of a golden brick, with the word "Platt" stamped in the centre, and following which, one on each page, are aphorisms pertinent to the subject stamped upon a brick. "Golden Light Shed by a Golden Buff Brick," occupies page 4, as a legend to be taken to the heart for future reference. Various notes and assertions are made on different kinds of bricks, and you are informed upon a bricklet that "You can obtain more light on the subject by addressing The Platt Pressed Brick Company, Des Moines, Ia."

HALL & KNOWLES, 7 Walnut Street, Philadelphia, have issued a small pamphlet that contains much information regarding North's Portland cement, for which they are the American agents. There are some six pages devoted to tenable tests from seven-day to twenty-four-day duration, with the results thereon, also a table of the chemical composition of the cement as determined by E. Roussel, La Chef Des Essais-Malines.

THE EMPIRE FIREPROOFING COMPANY — offices, Pittsburg and Chicago, factories at Brazil, Indiana, and Empire, Ohio — report a good business. This company has furnished the fireproofing material for some of the largest and best-known buildings in the country. A recently issued catalogue of this concern is most profusely illustrated with their method of fireproof construction.

THE PEERLESS BRICK COMPANY, of Philadelphia, have issued a new catalogue in which is illustrated their numerous patterns of moulded brick. There are many practical hints on the various ways these designs may be used in construction. A detailed price list is incorporated in the catalogue, — Peerless Brick Company, Philadelphia, Penn.

THE BRICKBUILDER.

AN ILLUSTRATED MONTHLY DEVOTED TO THE ADVANCEMENT OF ARCHITECTURE IN MATERIALS OF CLAY.

PUBLISHED BY

The Brickbuilder Publishing Company,

CUSHING BUILDING, 85 WATER STREET, BOSTON.

P. O. BOX, 3282.

Subscription price, mailed flat to subscribers in the United States and Canada	$2.50 per year
Single numbers	25 cents
To countries in the Postal Union	$3.00 per year

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Entered at the Boston, Mass., Post Office as Second Class Mail Matter, March 12, 1892.

THE BRICKBUILDER is for sale by all Newsdealers in the United States and Canada. Trade Supplied by the American News Co. and its branches.

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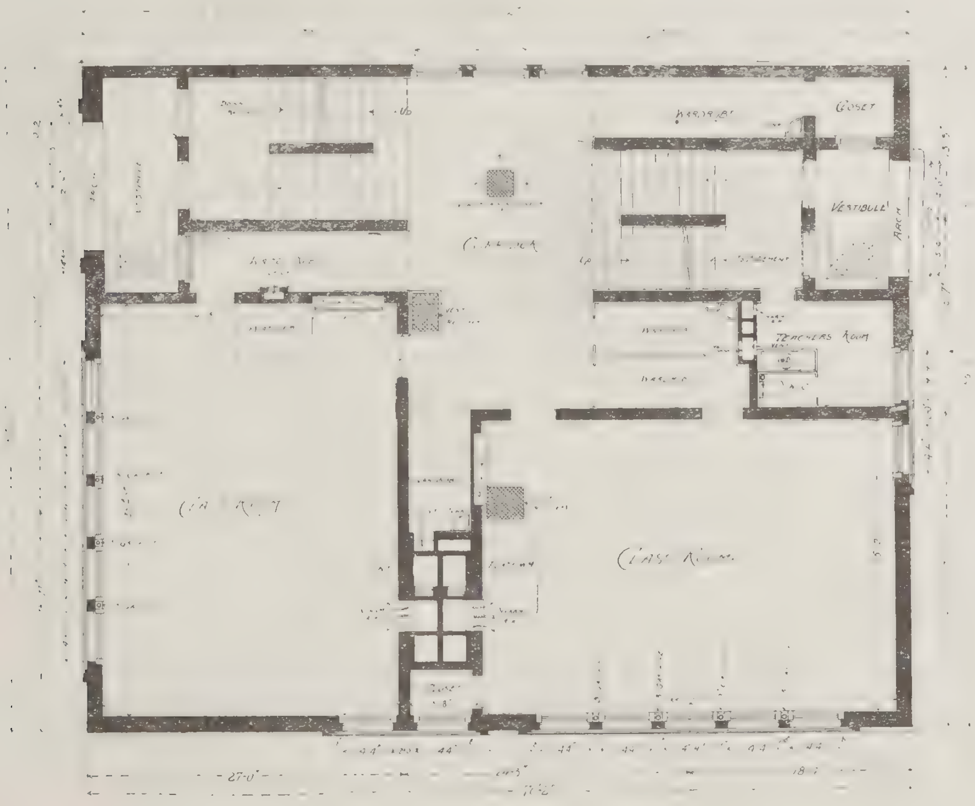


PLAN OF UNION HILL SCHOOL, WORCESTER. EARLE & FISHER, ARCHITECTS.

THE large office building opposite the Post Office, on Devonshire Street and Spring Lane, Boston, is an example of the durability of sandstone which we commend to the attention of our esteemed contemporary *Stone.* Messrs. Woodbury & Leighton have erected a scaffolding covering the entire building with a projecting shed to extend over the sidewalk and protect pedestrians from the chunks of sandstone which have been dropping without warning. This building is one of the comparatively new buildings of Boston. It is of red brick with brown sandstone trimmings. These trimmings, little as they project, have been a menace to people in the streets, and the owners are none too prompt in their action to at least make the building safe. The present intention is to first cut off the projections, and if the stone inside the wall is as rotton as that which projects, it will be entirely cut out, and brick or terra-cotta substituted. Specimens of the stone which we examined in Woodbury & Leighton's office, and also picked up on the sidewalk, crumbled like dried mud, between the fingers. From the inside of the building, window-sills were found with the projecting two or three inches nearly cracked through. A few examples of this sort should be sufficient to caution architects against any kind of sandstone that they do not actually know has stood a good long-time test. The day of crude, rockfaced sandstone is one we can now look back upon, as far as the best architectural practice is concerned, and the material, in any finish, is steadily giving way to brick and terra-cotta.

APROPOS of the fad, for such is it becoming, of using dark headers in Flemish bond, an interesting comparison may be made between those buildings where the contrast is very marked and those where the designer has been careful that there should be a little carelessness in sorting and laying the brick. One of the best examples of the latter case is Peabody & Stearns's Charlesgate stables, at the corner of Newbury Street and Massachusetts Avenue in this city. The regularity of the bond is not marked, but it is there, all the same, and counts very strongly in its delightful surface effect. We do not think of that wall as a decorated wall, though it has the charm of well-ordered variety. If, on the other hand, we turn to some plain wall surface, very carefully laid with dark headers, we cannot help having the pattern forced upon us to an extent which badly interferes with the architecture of the building.

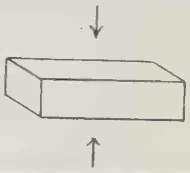
IN the smaller towns throughout the country there is an immense quantity of really good detail work in brick. Here and there a cornice or chimney, or belt course is found which is just as well designed, just as good in color as much of the old work in Europe we have a way of raving over. The cornice seems to be most often successfully done, which is perhaps natural on account of the fact that cornices on brick buildings are the most usual problem in detailing, the chimneys seldom coming in for anything in the way of decorative treatment.

A SERIES of careful tests at the Watertown, Mass., U. S. Arsenal is always of interest to architects no matter what the building material. The testing machine has a capacity of 800,000 pounds, and the work done by it is absolutely accurate. We have been furnished the results of brick tests made for the Eastern Hydraulic-Press Brick Co., of Philadelphia, and give some of the tables here.

ABSORPTION OF WATER AFTER IMMERSION OF ONE WEEK.

Test No.	Description.	Weight Dry.		Absorption of Water.			
				Total.		By Weight.	By Volume
		Lbs.	Oz.	Lbs.	Oz.	Per Cent	Per Cent.
7,054	Shade 200	5	7¼	-	6	6.9	14.5
7,057	Shade 220	5	7		4¾	5.5	11.6
7,059	Shade 300	5	5¾		6¾	7.9	16.1
7,061	Shade 390	5	4¼		6	7.1	14.5
7,064	Shade 410	5	7		4¾	5.5	11.4

COMPRESSION TESTS.



Compressed surfaces faced with Plaster of Paris to secure even bearings in the Testing Machine.

Test No.	Description.	Dimensions.			Sectional Area Sq. In.	First Crack Lbs.	Ultimate Strength.	
		Height.	Compressed Surface.				Total Lbs.	Lbs. per Sq. In.
7,053	Shade 200	2.21″	4.01″	8.11″	32.52	332,000	481,900	14,818
7,054	Shade 200	2.21	4.00	8.08	32.32	381,000	509,100	15,752
7,055	Shade 210	2.26	4.00	8.08	32.32	371,000	445,100	13,771
7,056	Shade 210	4.00	2 18	8.02	17.48	162,900	162,900	9,319
7,057	Shade 220	2.20	3.95	8.10	31.99	335,700	519 900	16,252
7,058	Shade 220	2.20	3.97	8.08	2.08	339,000	464,700	14,485
7,059	Shade 300	2.18	4.08	8.12	33.13	328.000	447,000	13,492
7,060	Shade 300	4.04	2 21	8.09	17.88	165,800	165,800	9,237
7,061	Shade 390	2 20	3.97	8.16	32.40	302,000	392,800	12,123
7.062	Shade 390	2.22	3.98	8.15	32.44	295,000	454,000	13,995
7,063	Shade 410	2.22	3.98	8.10	32.24	355,000	486,200	15,081
7,064	Shade 410	3.94	2.22	8.19	18.18	166,000	180,800	9,945

TRANSVERSE TESTS.

Supported at ends, loaded at the middle. Middle loaded over a length of 1″.

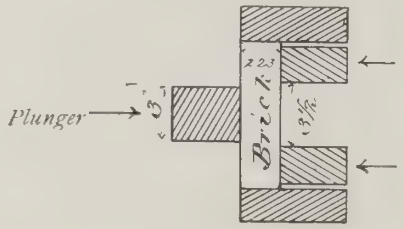
Test No.	Description.	Distance between End Supports.	Dimensions.		Ultimate Strength.	
			Breadth.	Depth.	Total Lbs.	Modulus of Rupture R.
206	Shade 200	6″	4.01″	2.25″	2,110	936
207	Shade 210	6	3.98	2.22	2,685	1,232
208	Shade 220	6	4.01	2.18	2,257	1,066
209	Shade 300	6	4.05	2.22	1,660	756
210	Shade 390	6	3.97	2.22	2,258	1,038
211	Shade 410	6	4.02	2.23	2,163	974

COMPRESSION OF HALF BRICKS.

Fragments after Transverse Tests were made.

Test No.	Transverse Test No.	Dimensions.			Sectional Area Sq. In.	First Crack Lbs.	Ultimate Strength.	
		Height.	Compressed Surface.				Total Lbs.	Lbs. per Sq. In.
7,123	206	2.25″	4.01″	4.11″	16.48	174,000	200,100	12,142
7,124	206	2.25	4.01	4 00	16.04	196,000	216,600	13,504
7,125	207	2.22	3.98	4.09	16.28	175,000	200,050	12,288
7,126	207	2.22	3.98	3.93	15.64	199,000	216,100	13,817
7,127	208	2.18	4 01	4.00	16.04	175,000	242,800	15,137
7.128	208	2.18	4.01	4.06	16.28	218,000	262,600	16,130
7,129	209	2.21	4.05	4.00	16.20	125,000	195,300	12,055
7,130	209	2.21	4.05	4.10	16.60	149 000	204,800	12,337
7,131	210	2.22	3.97	3.52	13.97	146,800	171,900	12,305
7,132	210	2.22	3.97	4.62	18 34	187,000	230,800	12,584
7,133	211	2.23	4.02	4.19	16 84	159 000	212 000	12,589
7,134	211	2 23	4.02	3.98	16.00	164,000	210,300	13,144

SHEARING TESTS.



Test No.	Description	Shearing Dimensions.	Shearing Area.	Transverse Fracture Developed on Tension Side.	Shearing Strength		Surface Sheared.
					Total Lbs.	Lbs. Per Sq. In.	
		Inches.	Sq. inches.	Lbs.			
227	Shade 210	2.23 x 3.99 x 2	17.80	4,800	20,780	1,167	One
228	Shade 220	2.21 x 3.97 x 2	17.55	7,600	19,250	1,097	One
229	Shade 390	2.20 x 3.96 x 2	17.42	10,100	17,220	988	Two

(Signed) J. W. REILLY, Major Ordnance Dept., U. S. A.,
Correct. (Signed) J. E. HOWARD. Commanding.

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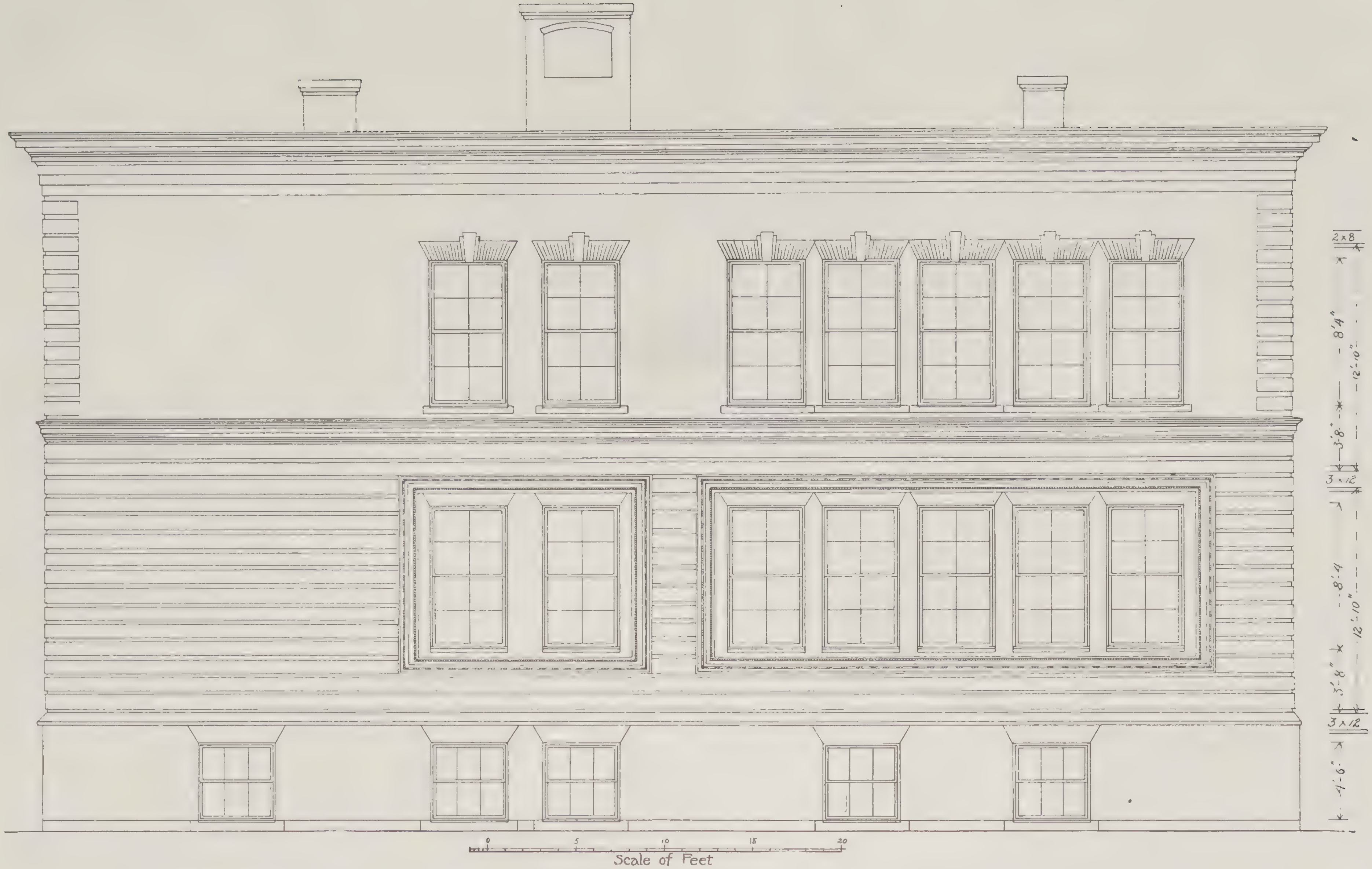


UNION HILL SCHOOL, WORCESTER, MASS.

EARLE & FISHER, ARCHITECTS.

Elevation at one eighth inch scale. See page 227 for plan.

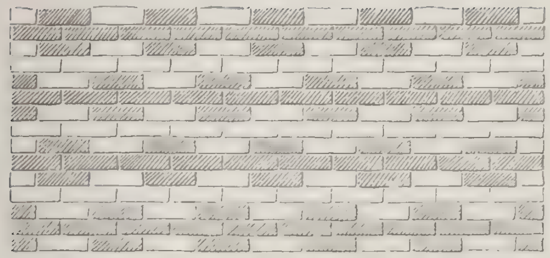


Fig. 14

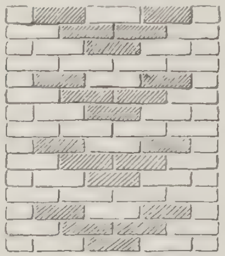


Fig. 15.

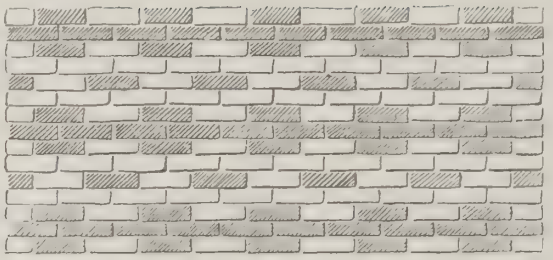


Fig. 16.

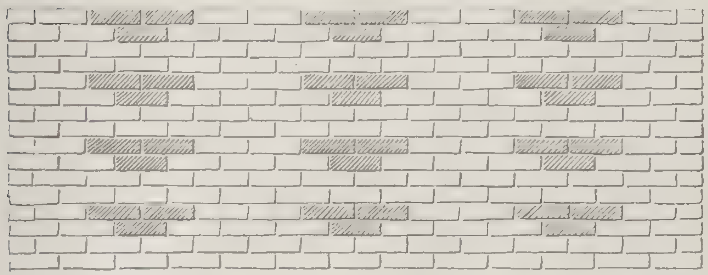


Fig. 17.

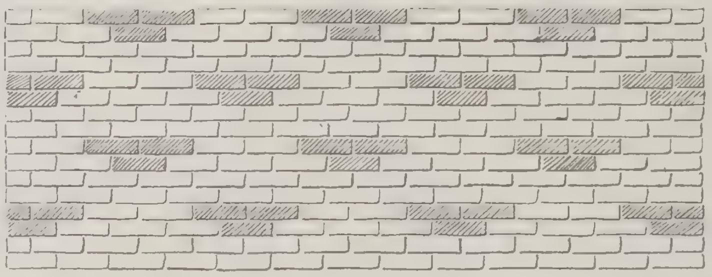


Fig. 18

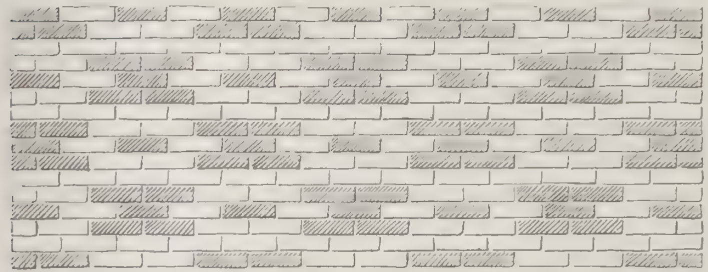


Fig. 19.

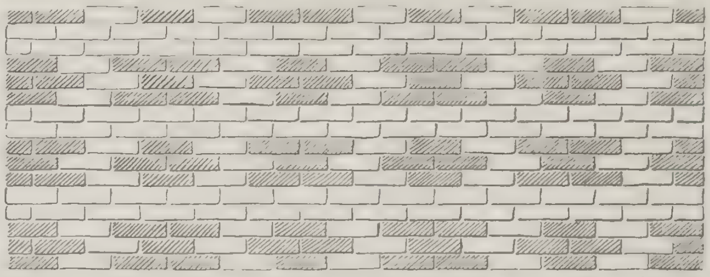


Fig. 20

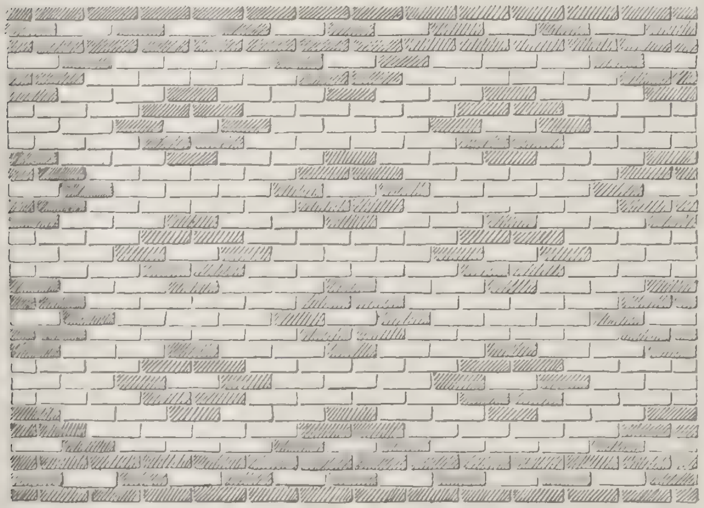


Fig. 21.

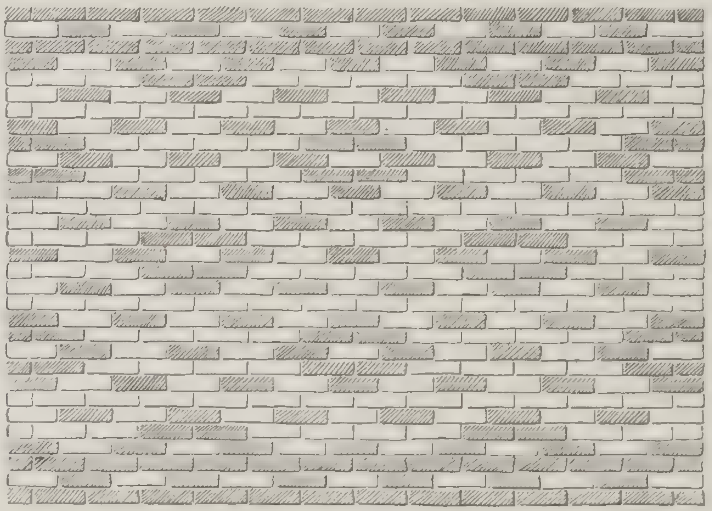


Fig. 22.

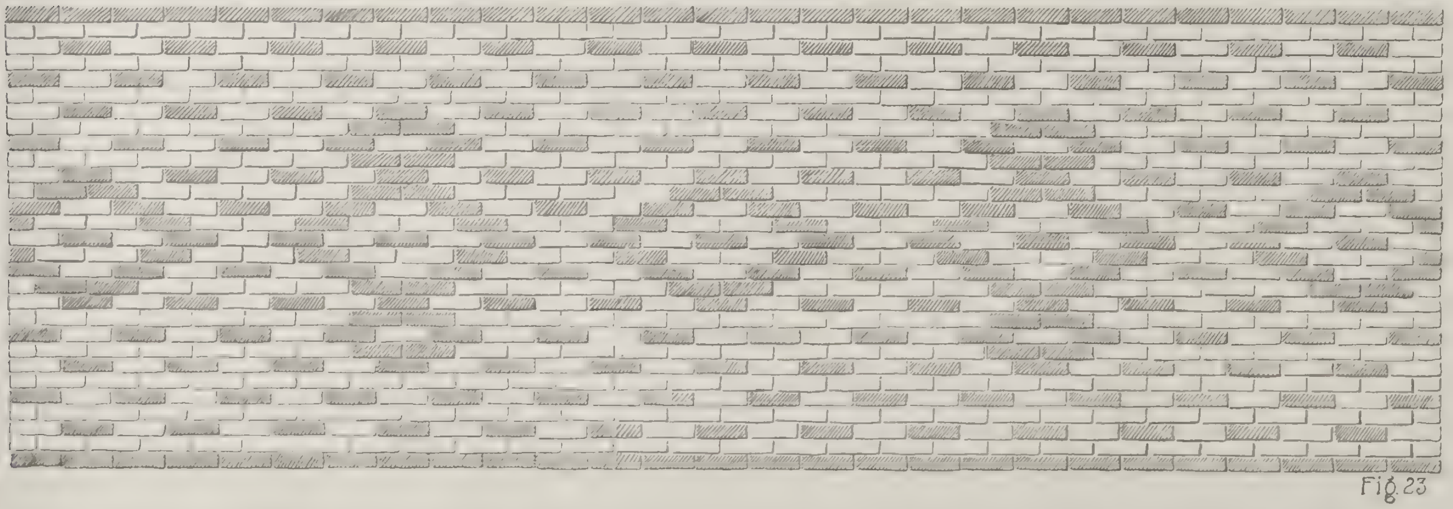
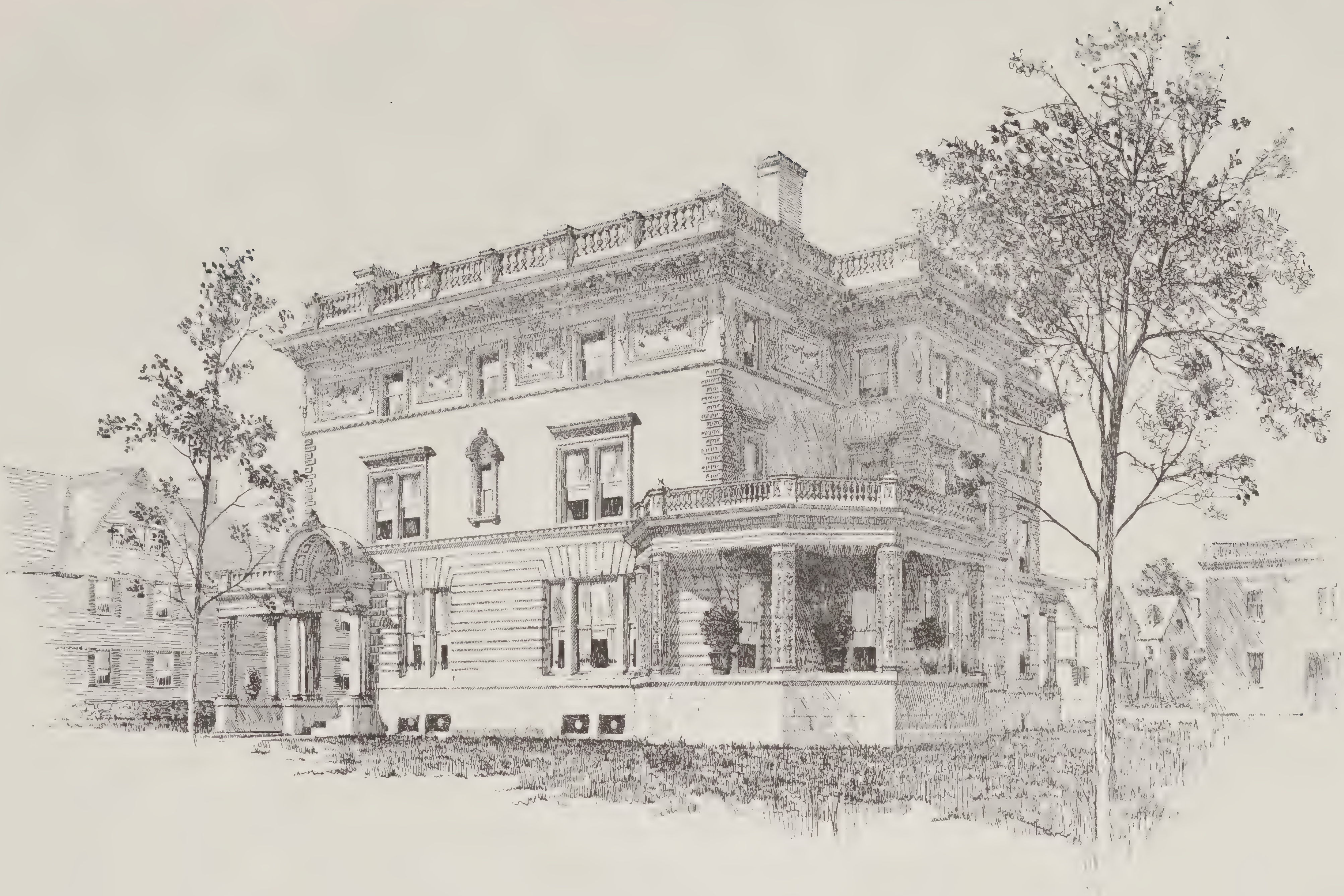


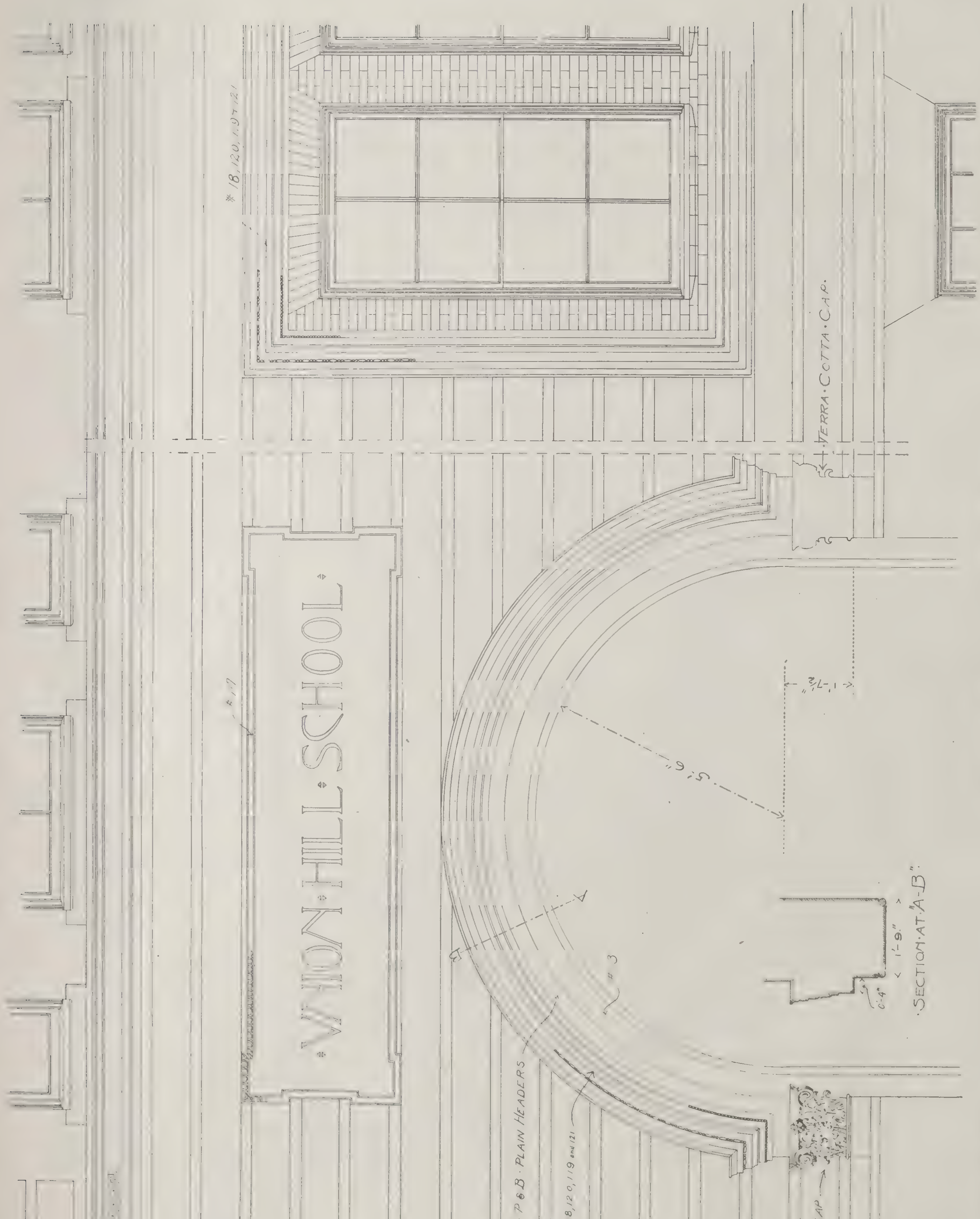
Fig. 23

DESIGNS FOR PATTERN WORK, AMERICAN BOND, TWO COLORS. (See Contractors' Department.)



RESIDENCE OF MR. W. H. GORSLINE. EAST AVE., ROCHESTER, N.Y.
J. FOSTER WARNER ARCHITECT

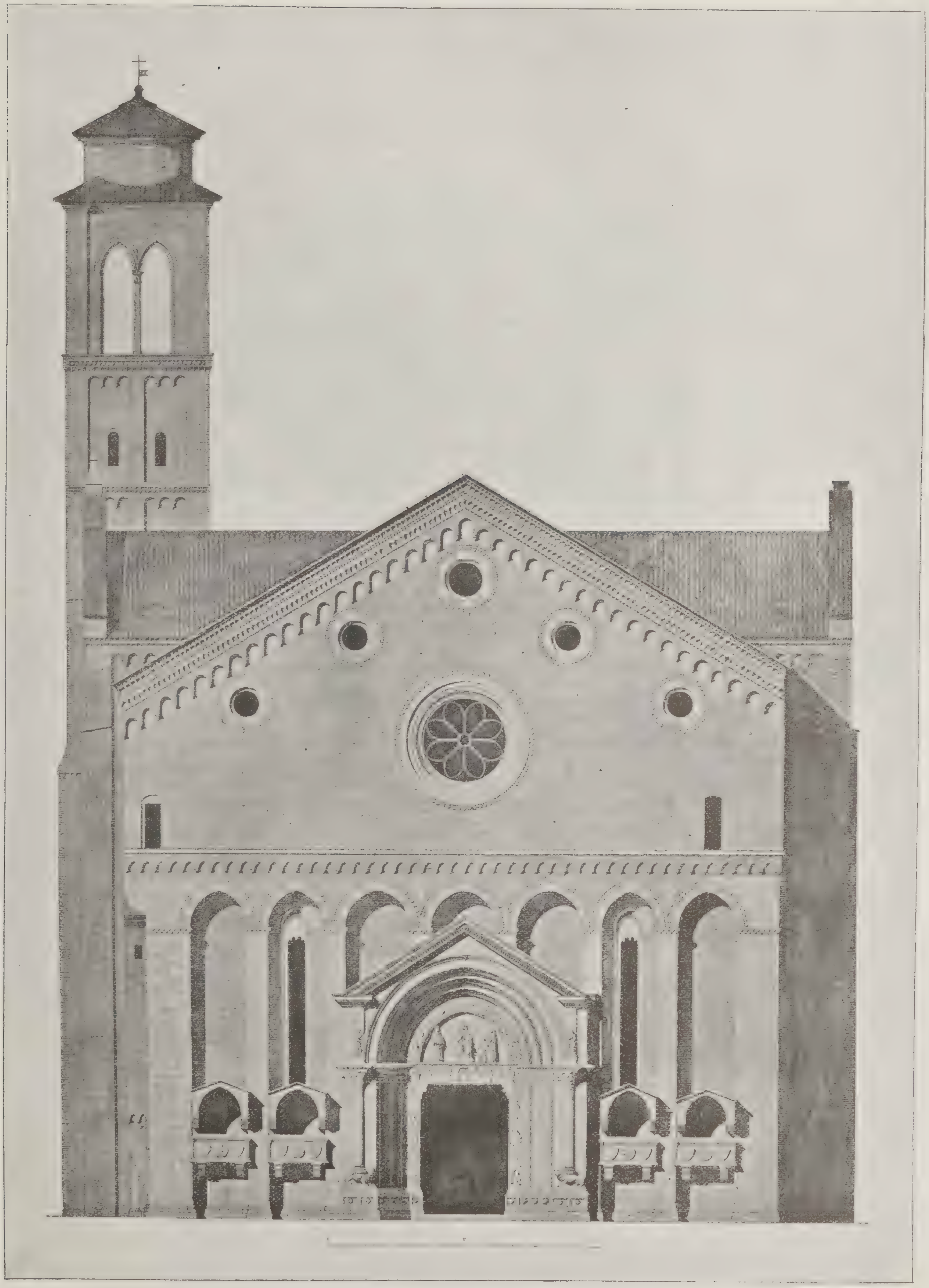
BUFF BRICKS FROM EASTERN HYDRAULIC PRESS-BRICK CO. TERRA-COTTA FROM PERTH AMBOY TERRA-COTTA CO.



UNION HILL SCHOOL, WORCESTER, MASS.

At three eighths inch scale. See page 227 for plan

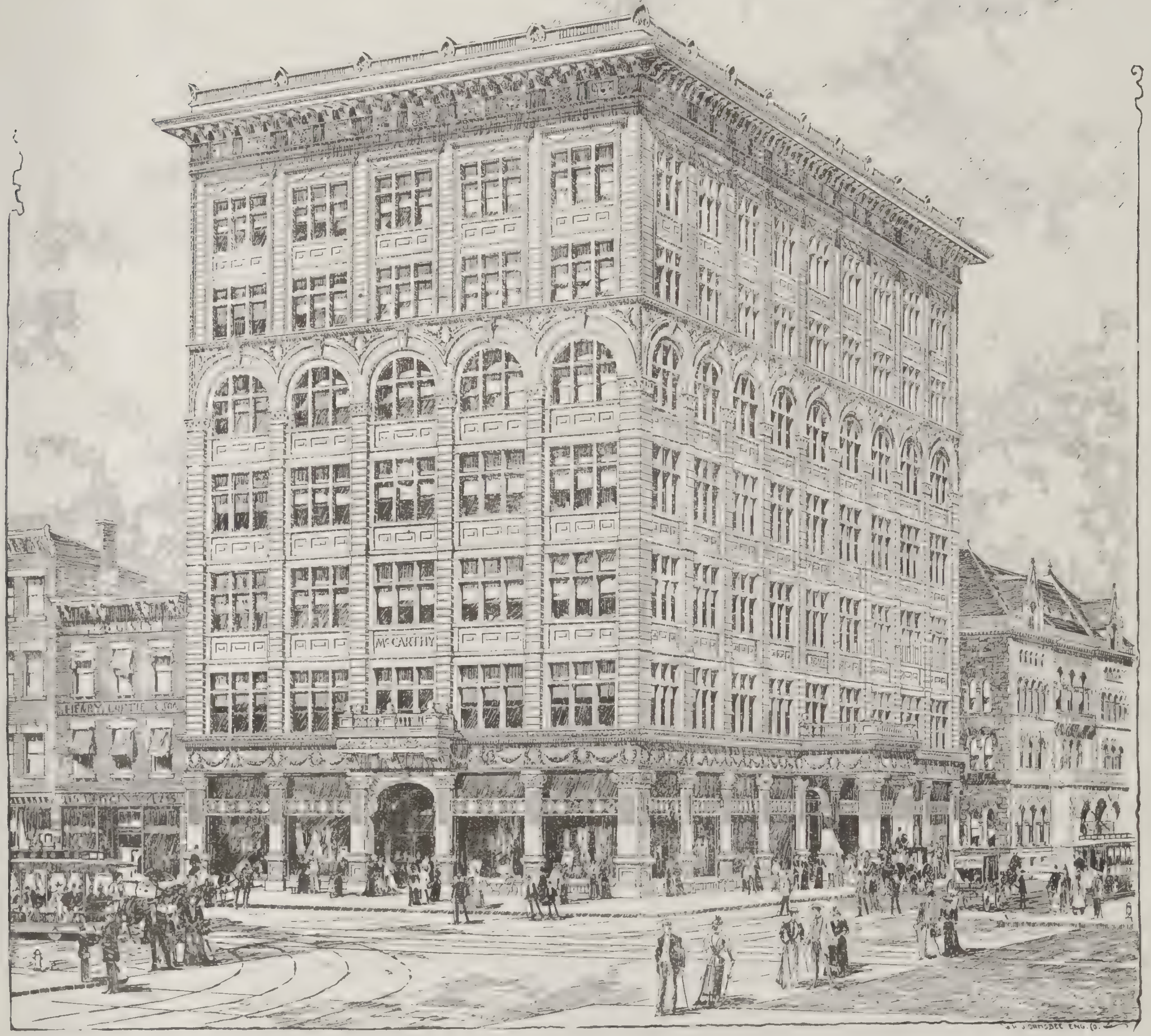
EARLE & FISHER, ARCHITECTS.

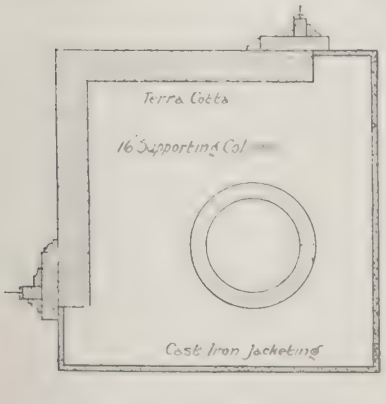


ELEVATION OF SAN LORENZO, VICENZA, FROM STRACK.
Supplementary Illustration to "Brick and Marble in the Middle Ages."

THE McCARTHY BUILDING.

Chas. E. Colton, Arch't., Syracuse, N.Y.





CORNER, EXTERIOR COLUMN

IT will be a matter of surprise to many of our readers as it was to us, to find in a city the size of Syracuse so large a building as the above entirely devoted to the retail dry goods trade of one house, — Messrs. McCarthy & Co. The building is built according to the most improved methods of steel skeleton, fireproof construction, the columns being cased with three-inch terra-cotta, the floors filled and protected by hollow tile arches of porous terra-cotta. The detail here given shows the casing of the corner column. The underwriters have given the construction more than usual attention, and are extremely well satisfied with it. The exterior is buff brick furnished by Fiske, Homes & Co., Boston, with terra-cotta to match made by the Perth Amboy Terra-Cotta Co. The fireproofing is that of the Staten Island Terra-Cotta Lumber Co., of New York.

FIREPROOFING.

A Department Conducted in the Interests of Building Construction to Prevent Loss by Fire.

FIREPROOFING CITY HOUSES.

AN article by C. H. Blackall in the September number of THE BRICKBUILDER, under the above caption, purports to criticise a description of Manly N. Cutter's fireproofing system which appeared in the August issue of *The Architectural and Building Monthly*.

To criticise the critic is my province now, and as Mr. Blackall starts out with an erroneous statement and draws conclusions from false promises the task is not a difficult one.

Mr. Cutter has not claimed, as his critic asserts, that the fireproof structure built according to his system will cost "less than one per cent more than if built with the ordinary wooden inflammable construction." Not quite three per cent was Mr. Cutter's statement, and if Mr. Blackall had glanced at the comparative estimates which were reprinted in his article he could easily have seen what a palpable blunder he was starting out with.

Mr. Blackall's next statement is a little cloudy. He says: "Although an ordinarily well-built house with wooden floor-beams, hollow wooden walls, and hollow furrings practically very seldom catches fire or is injured by any conflagration unless the flues or the electric wires are wrongly disposed, and although, judging by results, the wooden floor and wall construction is actually not as bad as it sounds, there is, nevertheless, no question but that some form of reasonably fireproof construction would be far preferable if it fulfilled the same conditions of comfort and expense."

I do not quite understand what mental reservation Mr. Blackall seeks to cover under that word "practically." Any house that only catches fire theoretically ought to be good enough, but the records of the New York Fire Department during the three months ending Sept. 30 show that twenty-one "ordinarily well-built houses" were the victims of fires which "practically" left only an inorganic residue on the sites.

Mr. Blackall makes another mistake when he says that "Like nearly all new things, there is little that is unusual in this construction."

There would have been nothing unusual in electric traction if it were not for the dynamo, and if Mr. Blackall ignores the fundamental principle in Mr. Cutter's system he can hardly expect to find much that is unusual. That principle is the steel wire which, under tension, binds posts and beams, walls and floors in one entity, and secures the full factors of strength and stability, all the other accessories being only required for warmth, convenience, and appearance. It is this wire which makes the thin wall practicable and secures the gain, on outside walls alone, of ten to fourteen inches in floor space, a circumstance entirely ignored by Mr. Blackall. Thus is also answered Mr. Blackall's statement that "a four-inch wall is entirely too flimsy," for in Mr. Cutter's system this four-inch wall, with its wire band, is much stronger than the brick wall of ordinary construction. But to show how far a critic can get away from facts, I will add that there are many houses in New York City with four-inch walls of brick backed with terra-cotta between iron uprights, which, even without the wire netting, are not considered either flimsy or lacking in strength. Mr. Blackall's suggestion in regard to outside cement plaster has been proved impracticable in hundreds of cases in this climate.

A total revolution in conventional methods can hardly be considered anything but unusual, and Mr. Cutter's system is destined to cause such a revolution as surely as it can be proved that its cost can be closely approximated to that of the present ordinary methods, and this approximation Mr. Cutter has demonstrated in the clearest manner by estimates from reputable parties covering every item in either kind of construction. These estimates are now before the writer, and the names of the parties are sufficient refutation of Mr. Blackall's innuendo that "It certainly seems as if either the New York prices quoted were very high for masonry and timber or extremely low for iron and terra-cotta." Mr. Cutter would indeed be a fool to enter the arena with such a flaw in his armor as this critic most ungraciously hints at. The estimates which he quotes are *bona fide* bids from J. B. & J. M. Cornell, New York, Raritan Hollow and Porous Brick Company, New York, E. M. Waldron, contractor and mason, New York, Jeans & Taylor, builders, New York, and, instead of the iron and terra-cotta being quoted extremely low, I have, for the latter item at least, a lower quotation from the Staten Island Terra-Cotta Lumber Company of New York.

Now, when Mr. Blackall goes in for estimates on his own account, his calculation is simply an outrage upon mathemetical exactitude, and entirely unworthy of even the veriest tyro in the science of estimating. While Mr. Cutter states with exact precision the cost at current market price and current value of labor of every item entering into the construction of three houses built according to his method, Mr. Blackall proceeds to give such vague and incompetent information as the cost of brickwork per square foot of surface in Boston, and even here he uses his pet qualifying adverb, the figure he gives being "practically" fifty cents. All his estimates are of the same character, — so much per foot for so and so, — and there is only one that needs or deserves to be considered. That is where he assumes that Mr. Cutter's sysem provides for ten-inch iron beams for a four-story American basement house with sixteen-foot span. We hardly looked for this absurdity from an architect of Mr. Blackall's standing. Mr. Cutter's estimate is for eight-inch beams, and if the building laws of New York did not prohibit, even much lighter beams could be used with a factor of safety exceeding that generally required.

One word in conclusion on the question of insurance. This is what Mr. Blackall says: —

"Even if the cost of such fireproof construction did not exceed ten per cent more than the cost of a similar building erected with the ordinary construction, the greater sense of security resulting, as well as the diminished insurance premiums, would surely make it an object, in the majority of cases, to adopt the fireproof construction. Unfortunately the fire-insurance companies do very little to foster such attempts. Generally speaking, the saving in insurance rates affected by using a thoroughly first-class construction is far less than the interest on the added cost over that of a shoddy building. Or, in other words, assuming that a building is to burn down sooner or later, it would pay an owner better to build poorly than to build well. Fortunately there are a great many property owners who are more far-sighted than the insurance companies, and are glad to welcome a construction such as Mr. Cutter has devised."

If Mr. Blackall stopped at the first sentence he would have done well, but his fortunate and unfortunate qualifications simply make a seesaw of his argument. I have read letters from the presidents of fire-insurance companies endorsing Mr. Cutter's system in most unequivocal terms and "practically" pledging themselves to foster it to the extent of their power.

JNO. G. LYNCH.

ANOTHER VIEW OF THE ABOVE SUBJECT.

TO THE EDITOR OF THE BRICKBUILDER:

Sir, — The article on "Fireproofing of City Houses" in your September number brings to the front that application of fireproof building methods that will be conceded, on thoughtful consideration, to be the most important of all the uses to which fireproof building can be applied.

When a commercial building burns the valuable papers and records of the occupants are almost invariably preserved by the fireproof vaults or safes, and the tenants are put to the inconvenience merely of securing new office room. But when buildings occupied as places of residence are destroyed there is a destruction of homes and all that that word implies; and one needs only to be burned out once, and return from business to find his wife and children without shelter, except through the kindness of neighbors, and to hear for months afterwards the regrets expressed by the family for the loss of some article of furniture or of ornament, or for the loss of some keepsake, to decide that if there is any class of building that should be made absolutely fireproof it is the buildings in which men have their families, and in which they hope to greet them on their return.

That the loss by fire in dwellings is no small matter may be shown by a reference to the valuable fire statistics complied by the New York *Chronicle*. These show that thirty-five per cent of all the fires in the United States occur in dwellings and tenements. During the nine years from 1882 to 1890 there were dwellings and tenements destroyed to the amouut of $79,741,400. Besides these there were boarding-houses destroyed to the value of $2,500,000.

When we consider this vast financial loss, and in connection with it the suffering and hardship that must have resulted to the inhabitants of the houses that were consumed, we must feel grateful to THE BRICKBUILDER for bringing forward for discussion a question a proper solution of which must tend to the safety and security of our families.

The question is how to make our dwellings fireproof, and the writer believes they should be so made, regardless of cost, but as long as the financial question is bound to intrude itself into the matter of housebuilding the fireproofer must benefit his fellows without adding materially to the cost of the home.

The first consideration is to abolish everything combustible from the structure, the burning of which would render the house uninhabitable, and to retain all those features of the house as at present constructed that give it what security it has from the ravages of fire.

The ordinary city house with its brick or stone front wall and brick rear and party walls is as near fireproof as it is possible to make it as far as its exterior walls are concerned, and nothing is gained either structurally or as a fireproofing method by substituting steel columns for the ordinary brick party walls, as the brick will stand more fire than the steel and the latter will cost with its fireproof enclosures fully as much as the brick.

The combustible parts of the ordinary house, and the parts that render the house uninhabitable when destroyed are the floors, partitions, and roof, and when we have them fireproof and durable we may rest assured that our house will not vanish into smoke. Some of the trimming may be destroyed, but the house will not be overrun by the fire.

Of the combustible parts of the house, the roof and the floors are the most important, and the writer proposes to describe what to him seems to be the best and cheapest fireproof floor and roof, and the only good one so far as he knows that is capable of competing in price with the ordinary construction. That the idea is patented should not prevent our recognizing its value, if it is a step towards safer and more durable homes. But first as to the difference in cost between the present combustible method and the one to be described.

Taking Mr. Cutter's figures for the cost of the floors and roof on the ordinary non-fireproof construction, we have

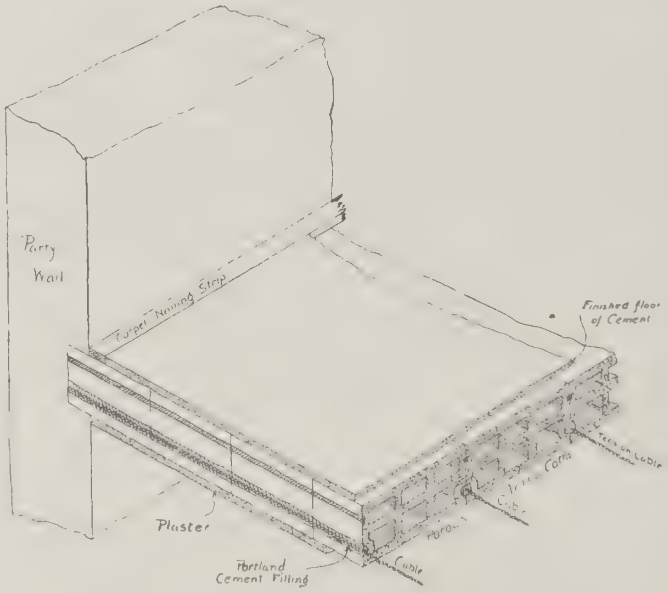
Floor and roof timbers	$1,743.00
Rough floors	810.00
Finished floors	1,500.00
Total for floors and roof	$4,053.00

The writer has added to Mr. Cutter's figures $1,500 for finished floors. These did not enter into Mr. Cutter's calculation, but as the floor herein described does not require any finished wood floors their cost should be added to that of the timbers and rough floors.

The writer has obtained from the Lee Fireproof Construction Company the following figures for floors and roofs in three houses described by Mr. Cutter, based on 13,000 square feet of floor and 3,250 square feet of roof. These figures cover the cost of the floors ready for the carpets and of the roof ready for the roof boarding.

Cost of Lee hollow tile floors	$3,900.00
Cost of Lee hollow tile roofs	910.00
	$4,810.00

This represents an additional cost of $757 for the three houses, or $252.33 for each house.



For the benefit of those who are unfamiliar with the Lee floor, it might be well to state that it is an extension of the end-construction-flat-arch idea.

A tension member is added to the bottom of the arch in the shape of a twisted steel cable of two strands. This tension member is buried in the tile near the bottom in a bed of Portland cement, which binds the tile and the cable firmly together. The arch thus becomes a genuine beam with the top in compression and the bottom in tension, and the spans can be increased to distances impracticable to the ordinary arch, while the depth of the floor is very small as compared with an arch doing the same work, and the thrust of the arch, being taken up by the tension member, disappears.

In the houses in question, the fireproof floors are supposed to be constructed on this method, and the finish of the floor to be concreted, with a smooth Portland cement surface. Around every room and passageway a narrow border of hard wood, two by three quarters inches is fastened to receive the tacks for fastening the carpets. Other than this there is to be absolutely no wood in the floor. The writer believes this makes the ideal fireproof and vermin-proof floor. The roofs to be built in the same manner, except that wood strips are to be dovetailed into the upper surface to receive the roof boarding.

As this article is growing to too great a length, the question of partitions will not be touched upon, but if owner and architects could be enabled to make the floors and roofs of houses as fireproof as they are at present making party walls, we would have houses that could not be destroyed.

The floor described is fireproof, vermin proof, strong, easily built, and low in cost, and, as there are no heavy I-beams to handle, the work can be done on any house by the mason contractor, and the architect has no other parties to deal with and no other contracts to make than he has at present.

WM. M. SCANLAN.

CHICOPEE, MASS.

EMPIRE FIREPROOFING COMPANY,

MANUFACTURERS AND CONTRACTORS FOR EVERY DESCRIPTION OF

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FOR FIREPROOFING BUILDINGS.

. . ALSO, MANUFACTURERS AND DEALERS OF . . . Salt-Glazed Terra-Cotta Wall Coping.

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"AMERICAN SEAL."

Mortar Stains. These are in four standard colors, RED, BROWN, BLACK and BUFF, furnished either in pulp or dry. They are made from such pigments only as I have found best adapted for the purpose. They are strong and durable and can be relied upon in every case. They mix easily with Lime or Cement. Special colors made to order.

AND

Elastic Oil Cement. This is made expressly for laying or embedding Slate and Tile Roofs, repairing leaks around Chimneys, Dormer Windows, Skylights, Scuttles and Fire Walls; it is waterproof and will not crack. Made in three colors, Red, Brown and Black.

WILLIAM CONNORS, Manufacturer, Troy, N. Y.

W. H. GATES, Agent, 30 Kilby Street, - - - - - - - - BOSTON, MASS.

MORTARS AND CONCRETES.

A Department devoted to Advanced Methods of using CEMENTS and LIMES in Building Construction.

IN subsequent issues of THE BRCIKBUILDER, it is the writer's purpose to enter upon a discussion of various concrete floor constructions. It will be the aim of the articles to have the various systems presented in a complete and intelligent fashion, with drawings, details, and such data as may be necessary or of value in making estimates and calculations. It is to be understood that while these various systems are to be presented by the respective companies or individuals most interested in them, they are not to be of the nature of advertisements, and are to be impartially discussed upon their merits. In this way, it is hoped to bring greater attention to bear upon the use of concrete in fireproof floor construction and at the same time bring each system forward to present its own advantages. The criticisms will be open to any one competent to judge, and will be absolutely impartial and unbiased. It is believed that a series of such papers will form an interesting and important addition to our technical knowledge, and it is hoped that whosoever undertakes to present his work will do so in a complete and thorough manner, that the subject may be thoroughly understood and, if desirable, discussed, after the manner of papers in the technical societies.

IN regard to the recent discussion of the virtues of American Portland cement, a letter has come to hand from a prominent firm of American manufacturers that throws some further light on the status of the American product. It is given below and presents the true state of things. We all wish to see the American brands take the lead, and to be able to feel that when we specify a given brand we have not to resort to the testing machine with every lot of ten barrels. Neither do we want to be under the necessity of securing guarantees and strict specifications regarding the output. We want to feel assured, as we do, when we use some foreign brands, that we have but to name the brand, and to secure the desired results.

We do not hesitate to say that the American manufacturer is going to attain that standard, and shortly enable us to use it to the exclusion of all foreign brands. We are aware that there are lots of foreign cements in the market that do not compare with American brands, but the great point we maintain is not a comparison of American brands with inferior foreign brands, but with the high-grade cements that are in every way so eminently satisfactory.

ROSS F. TUCKER.

ROSS F. TUCKER, ESQ., Nov. 15, 1894.
Care THE BRICKBUILDER:

Dear Sir, — Having read with much pleasure your articles in THE BRICKBUILDER on "Concrete Construction," and "American *vs.* Foreign Portlands," etc., I have been impressed with their value, and in the name of the company I represent, — Empire Portland Cement Company, of Warners, N. Y., wish to thank you.

Although ourselves American makers, we quite agree with you that a large portion of the so-called Portland cement made on this side is entirely unworthy of the name. We consider it directly to our own benefit to have this subject of what constitutes a true Portland cement thoroughly discussed. It is only because so little is known by the average architect, engineer, or contractor, about cement, that such a condition of affairs is possible. We would also like to see a Government Testing Bureau for cement established, similar to that of Germany, at Berlin. This would not only determine the true scientific and practical worth of American brands, but would protect our people from spurious foreign brands, of which there is an increasing importation.

Let us say, in closing, that we will at all times appreciate your critical opinion of our "Empire" Portland Cement, as obtainable from dealers generally. We would also take pleasure in showing you our process of manufacture in detail if you will at any time favor us with a visit to Warners, N. Y.

Respectfully yours,
CHARLES H. SPENCER,
Gen. Sales Agent.

NEW YORK AND ROSENDALE CEMENT CO.
MANUFACTURERS OF
"BROOKLYN BRIDGE" BRAND
ROSENDALE HYDRAULIC **CEMENT.** Warranted Superior to any Manufactured.
STRONGEST, DARKEST, BEST, ALWAYS FRESH.
USED ON
New York and Brooklyn Bridge. Washington Bridge, Harlem River.
Telephone, 190 Franklin. WM. C. MORTON, Secretary.
New York and Rosendale Cement Company — Rosendale Hydraulic Cement — Trade Mark — Office 280 Broadway (Room 61) New York.

A. J. SNYDER & SONS,
"CRESCENT" ☪ BRAND ROSENDALE CEMENT
is a superior quality of Hydraulic Cement. Especially manufactured for *important engineering* work, such as *Sewers, Reservoirs, Heavy Foundation, Masonry, Conduits, etc.*, requiring a high grade testing cement. Over *30,000* barrels of this cement have been used lately, on the new dams, for the Croton aqueduct. All this cement was subjected to the engineer's test, and not one barrel was rejected. We respectfully call the attention of Engineers and Architects, requiring a high grade cement to our "Crescent" brand. Samples furnished on application.
BERRY & FERGUSON,
37 to 45 Medford St., Charlestown,
Boston, Mass., Eastern Agents.
HENRY R. BRIGHAM, General Agent,
5 COENTIES SLIP, NEW YORK CITY.

AMERICAN CEMENTS.

NATURE has supplied this country with practically inexhaustible deposits of hydraulic limestones, and in almost endless variety of combinations.

In order to classify these varieties and reach intelligent conclusions concerning them, the following arrangement may be taken as fairly representative, considered subsequent to calcination.

1. Common quick-lime.
2. Slightly hydraulic lime.
3. Eminently hydraulic lime.
4. Hydraulic cement.

The deposits from which all or nearly all of these classes may be obtained occur in nearly every State and Territory of the United States.

It is the presence of clay in greater or less proportions in these limestones that confer upon them their hydraulicity, or power to set and harden either in air or water.

The greater the proportion of clay in a limestone, up to a certain fixed limit, the greater will be its hydraulic activity.

COMMON QUICK-LIME.

Pure lime of itself contains no setting properties whatever. It is a base which, if combined with an acid, like silica, loses its caustic properties, and takes a new form known as silicate of lime.

The latter, if composed of correct combining proportions, will, upon the application of water, commence to crystallize and harden, whether in air or water, and without an appreciable development of heat.

Pure lime alone when subjected to water will in the process of hydration develop heat as high as 300° F., but it will not crystallize, as has so often been stated by eminent writers.

That pure limestone occurs in massive crystalline form is due to its chemical combination with carbonic acid. It will also crystallize when combined with sulphuric acid, as in calcined gypsum, or plaster of Paris.

But with water alone, it will not crystallize. Mortars made from pure lime and sand will attain a certain degree of hardness when used above ground, due mostly to the process of drying out, and possibly a slight amount of reabsorption of carbonic acid.

This process is so slow however as to be inappreciable during an ordinary lifetime.

This is easily proven by placing in water a sample of the oldest lime mortar to be found. If the lime is approximately pure, the mortar will in a few days crumble into mud, and the lime will be taken up in solution in the water, and if the water is changed frequently the lime will entirely disappear, leaving the sand as clean as when in its native bed.

SLIGHTLY HYDRAULIC LIME.

Lime that contains sufficient clay to enable it to be classed as slightly hydraulic lime will contain ten to twelve per cent of clay. This amount of impurities will not prevent the lime from slaking, although it will slake more slowly than will a lime that is pure or nearly pure.

It will not appear as white as the latter, neither will it develop so high a degree of heat during hydration; but as a mortar-making material for brick or stone masonry, it is vastly superior to that of pure lime, as it contains inherent setting and hardening properties

DYCKERHOFF PORTLAND CEMENT

Is superior to any other Portland Cement made. It is very finely ground, always uniform and reliable, and of such extraordinary strength, that it will permit the addition of 25 per cent more sand, etc., than other well-known Portland Cements, and produce the most durable work. It is unalterable in volume and not liable to crack.

8,000 barrels have been used in the foundations of the Bartholdi Statue of Liberty, and it has also been used in the construction of the Washington Monument at Washington.

Pamphlet with directions for its employment, testimonials and tests, sent on application.

HAM & CARTER,
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78 William Street, NEW YORK,
Sole Agent United States.

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CONCRETE ENGINEERS

FIREPROOF FLOORS (Ransome System).

For Public Buildings, Hospitals, Schoolhouses, Office Buildings, Warehouses, Breweries, Stables, and Dwellings.

Contracts taken for all work in Portland Cement Concrete.

Foundations, Bridge Piers, Engine Beds, Retaining Walls, Pavements, Self-supporting Sidewalks and Sidewalk Lights (Ransome Patents).

Best Materials and Highest Skilled Workmanship.

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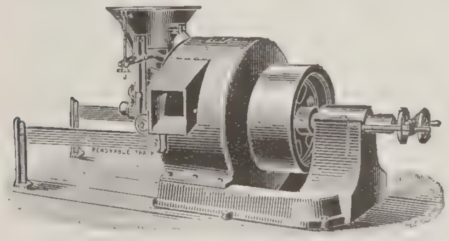
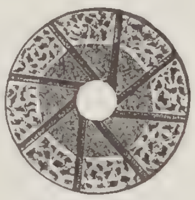


Sturtevant Rock Emery Mills

- - AND PATENT - -

TRADE **ROCK EMERY MILLSTONES.** MARK.



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Fastest fine grinder known.
Sturtevant Patent Vertical Mill has no rival for reducing ***Plaster, Paints, Chemicals, Carbons, Talc, Soapstone, Slate, Barytes*** and like materials. 30" Mill Costing but $400, grinds to fine powder from 1 to 4 tons per hour. No foundations, no screens, no noise, no dust. Remember that for $400 you have a machine that is ***ready to run*** and that will keep running longer without repairs than any other fine grinder. Send for special circular.

Made of Blocks of Rock Emery set in Metal, making the hardest and most cutting millstone ever built, and not expensive.

A Customer Writes:

Sellersburg, Ind., June 25, 1894.

We can grind from 70 to 75 bbls. Louisville Cement per hour with your Rock Emery Stones. This is from 10 to 15 bbls. more per hour than our ordinary stones will grind. Since May 3 have dressed these but twice. Ordinary Stones we dress every three days. Rock Emery Stones save us several dollars per week in dressing alone.

CLARK COUNTY C. CO.

RAPID — because Rock Emery has no equal for cutting qualities. ECONOMICAL — because Rock Emery is the most durable grinding surface known. NO EXPERIMENT — because many large manufacturers in your own line already use and indorse them, and hundreds in use for other purposes.

SEND FOR CIRCULARS AND REFERENCES.

STURTEVANT MILL COMPANY, 70 KILBY ST., BOSTON.

amounting — with the proportion of clay mentioned — to about thirty per cent of silicates or active setting matter, *i. e.*, hydraulic cement.

Such a lime when made into mortar with the requisite amount of sand will cement properly-moistened bricks so firmly together that in a few years the bricks, rather than the mortar, will be disrupted when subjected to tensile strain.

EMINENTLY HYDRAULIC LIME.

When clay is present in a lime to the extent of eighteen to twenty-two per cent it is classed as an eminently hydraulic lime. Containing about fifty per cent of hydraulic cement, it will, when properly calcined, then reduced to powder and hydrated, then thoroughly mixed with sand, produce a mortar that, for enduring qualities, when exposed to the atmosphere, is superior to any known mortar-making material.

It is sufficiently hydraulic to be classed as a very slow-setting hydraulic cement.

Concrete made from such a mortar will require from sixty to ninety days to become sufficiently hardened to bear submersion.

This quality of lime has been used extensively in Europe for many years in the making of concrete blocks for sea-walls and general submarine masonry, — notably in France during the past sixty years.

Beckwith states that the hydraulic limestone quarries of Tiel, France, have been worked for several centuries.

John Smeaton, C. E., of England, used an eminently hydraulic lime mortar in the construction of the Eddystone Lighthouse, in 1757.

There are tens of millions of tons of this class of hydraulic limestone in this country, that can be cheaply produced, and will be, whenever our engineers and architects may create a demand for it.

HYDRAULIC CEMENTS.

A limestone that, after calcination, is proven by analysis to contain thirty-eight to forty-two per cent of clay will produce an active setting hydraulic cement.

Upward of one hundred and forty million barrels of this class of cements has been produced and consumed in the United States since its first production, in 1818.

During the last ten years ending Jan. 1, 1894 the production was 61,894,878 barrels.

Fully ninety-five per cent of all the great engineering and architectural work of this country has been done with this class of American rock cements.

The failures to do excellent work will not aggregate one hundredth of one per cent.

Probably no country on the globe is more favored with such an abundance, and of such excellent quality, of natural cement rock, as is known to exist in a vast number of localities in this country.

In a few localities in France there are natural rock cement beds of first quality, but in England they occur very rarely.

In our classification of impure limestones of the United States we have defined the proportions of clay within certain narrow limits for the sake of a starting point, but the proportions of clay to lime varies in different localities, and the action of these ingredients is largely dependent on the proportions of the constituent parts of the clay, also when magnesia to a greater or less extent enters into the combination, all of which has an important bearing on the enduring qualities of a cement.

These and other important features will be discussed in future papers.

URIAH CUMMINGS.

Mannheimer Portland Cement.

UNEXCELLED IN QUALITY.

"The results of tests with standard quartz are far above the average of most cements."
CLIFFORD RICHARDSON,
Inspector of Asphalt and Cements,
Engineer Dept., Washington, D. C.

"This brand of Portland Cement was found especially qualified for the purpose of concrete casting on account of its perfect uniformity, intensive fineness, progressive induration after the first setting, and of its great tensile and crushing strength."
Vide Report of CARL A. TRIK,
Superintendent of Bridges, Philadelphia,
On Concrete Arch Highway Bridge over Pennypack Creek.

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ENGLISH PORTLAND CEMENT celebrated for Reliability, Chemical Purity, Great Strength, High Sand Carrying Capacity and General Uniformity. Quantity imported yearly far greater than any other brand.

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"Lafarge"

French Portland Cement, the only material to use for setting, pointing, and backing LIMESTONE and GRANITE.

Will not stain and makes the strongest binder.

James Brand, Importer, 81, 83 Fulton St., NEW YORK.
34 Clark St., CHICAGO.

A SECOND REPLY TO MR. TUCKER.

PHILADELPHIA, Nov. 19, 1894.

EDITOR OF THE BRICKBUILDER, Boston, Mass.:

Dear Sir: — We note in Mr. Tucker's reply to the writer's letter in last month's BRICKBUILDER that he does not give any data to defend his assertions that "The German Portland Cements are the finest in the world," and that the American Portlands "have a long road to travel before reaching the standard of excellence attained by our rivals across the water," but does admit, to use his own words, "that some American manufacturers can produce a cement equal, nay, superior, to the foreign article." This is a great admission for any one to make after using the terms he did in his former article, but he spoils all the good it did by insinuating that such cements are made for particular jobs and on special occasions, so necessitating the writer to again take up the subject, and, as further proof that there

TABLE No. 1.

GEO. S. WEBSTER, *Chief Engineer.* R. L. HUMPHREYS, *Inspector of Cement.*

BRAND.	FINENESS. NO. 50 SIEVE.	NO. OF SAMPLES.		NO. OF BRIQUETTS.		AVERAGE TENSILE STRENGTH IN LBS. PER SQUARE INCH.					
		COLLECTED.	REJECTED.	MOULDED.	BROKEN.	7 DAYS.	28 DAYS.	2 MOS.	3 MOS.	4 MOS.	6 MOS.
Bell, Belgium, ...	98.13	3	2	24	22	320	439				
Dagger, "	99.25	1		8	8	403	433	463			
Alsens, German, ...	99.38	2		16	16	435	490	603	615		
Dyckerhoff, "	99.52	33		264	226	446	526	551	561	574	647
Germania, "	100.00	1		8	8	388	476				
Mannheimer, "	99.42	52	3	416	340	370	434	460	502	524	555
Offenbach, "	99.65	6	3	48	44	303	408	419			432
Brooks, Shoobridge, English,	96.25	2		28	18	352	526				
Burham, "	95.58	55	5	420	361	360	445	493	511	540	591
Gostling, "	94.00	3	1	24	22	435	443	525	571		
Hilton, "	94.13	4	2	40	36	367	415	457			653
Dragon, American, . . .	99.75	1		8	8	347	408	545			
Egypt, " . . .	99.21	11	4	88	82	330	400	451		495	612
Whitaker's, " . . .	99.80	3		24	24	373	560	575		722	
Saylor's, " . . .	100.00	15		120	84	413	549		602		

ATLAS PORTLAND CEMENT.

WARRANTED EQUAL TO ANY AND SUPERIOR TO MOST OF THE FOREIGN BRANDS.

OFFICIAL TESTS, Nos. 3567 and 3568, made by the DEPARTMENT OF DOCKS, New York, March 31, 1894, being part of contract No. 464 for 8,000 barrels.
TENSILE STRENGTH, 7 days, neat cement . . . . 622 lbs.
" " 7 days, 2 parts sand to 1 of cement . . . . . . 332 lbs.
Parts steamed and boiled . . . . Satisfactory.

All our product is of the first quality, and is the only American Portland Cement that meets the requirements of the U. S. Government and the New York Department of Docks. We make no second grade or so-called improved cement.

ATLAS CEMENT COMPANY, 143 LIBERTY STREET, NEW YORK CITY.

Holy Trinity Parish House,

PHILADELPHIA.

◆◆

Buff and Pompeian Brick Laid in Clinton Hematite Red.

◆◆

Messrs. Hewitt & Bro., Architects,
PHILADELPHIA.

◆◆

Messrs. Dorsey & Smith, Builders,
PHILADELPHIA.

◆◆

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High Grade Mortar Colors and Metallic Paints.

Eastern New England Agents:

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are American brands equal to the German brands, we submit the following tests: —

TABLE No. 2.

The following are the principal brands of Portland Cement which have been tested:—

BRAND.		RESIDUE ON SIEVE.		TENSILE STRENGTH.			
				NEAR.		THREE PARTS QUARTZ.	
		NO. 50	NO. 100	7 DAYS.	28 DAYS.	7 DAYS.	28 DAYS.
Germania,	German.	Trace.	6	550	675	180	235
Dyckerhoff,	"		6	740		210	
Porter,	"		8	500		115	
Schifferdecker,	"	Trace.	8	350	430	140	160
Alsens,	"	"	9	420		145	
Hanover,	"					120	166
Best German,	"		6	700		170	
White's,	English.	1.	24	492		108	
New Castle,	"	1.5	10	550	700	130	200
Giant,	American.		6	640	680	160	250
Atlas,	"	Trace.	8.5	650	675	175	175
Belfouse,	"	1.5	13	430	598	96	137
Whitaker,	"		2	790	880	230	350
Empire,	"	Trace.	12	800	920	120	170

Table No. 2 is from the report of the Engineer Department of the District of Columbia for the year 1893.

Table No. 3 shows tests made by Prof. F. P. Spaulding, of the Cornell University, as published in the *Engineering News* of Aug. 24, 1893. In connection with these tests Mr. Spaulding says: "The samples used in the tests are all of well-known brands in common use in this country, and were taken for this purpose because they were conveniently at hand and seemed to represent all grades."†

Now if Mr. Tucker has made tests the results of which would warrant the broad assertions that he has made, we would like to see them in the next issue of your paper. Certainly your readers are entitled to know upon what extent of investigation such assertions are based, as it is well known that the results of other engineers' tests have shown that Mr. Tucker's opinion of American Portland Cement — no matter how many other engineers in the country possess the same opinion — is erroneous.

Very truly yours, WM. G. HARTRANFT,
Vice-President Commercial Wood & Cement Company,
Philadelphia, Penn.

TABLE No. 3.

DESIGN OF SAMPLE.	KIND OF CEMENT.		PERCENTAGE PASSING THROUGH SIEVE.			TIME OF SETTING.	TENSILE STRENGTH IN LBS. PER SQ. IN. NEAT CEMENT.					TENSILE STRAIN IN LBS. PER SQ. IN. 1 CEMENT AND 3 SAND.		COLD WATER TEST. 50° & 60° F.	BOILING TEST.
			2,500 MESHES PER SQ. IN.	6,400 MESHES PER SQ IN.	32,400 MESHES PER SQ. IN.	IN MINUTES.	1 WEEK.	4 WEEKS.	13 WEEKS.	26 WEEKS.	52 WEEKS.	7 DAYS.	28 DAYS.		
A	English	Portland.	91	77	62	25	221	312	460		620	58	117	Sound after 1 Year.	Sound.
B	"	"	93	82	67	90	234	397	491		675	66	142		"
C	German	"	98	88	67	240	332	491	627		720	80	122	"	"
D	"	"	99	93	70	300	307	487	580		672	117	169	"	"
E	American	"	96	86	66	185	315	487	523		720	155	212	"	"
F	"	"	100	91	68	95	307	454	507		702	100	174	"	"
K	English	"	95	84	58	20	442	502	535	551		106	188	Sound after 6 Mos.	"
L	German	"	98	94	65	320	374	487	541	560		134	164		"
M	American	"	99	96	70	90	352	439	521	556		101	159	"	"

Table No. 1 shows some of the leading brands of cement tested by the Survey Department of the city of Philadelphia during 1893 — samples collected from time to time as the work progressed.*

---

*For full account of all tests see Annual Report of the Director of Public Works, Philadelphia, 1893.

†For full report of tests see *Engineering News*, Aug. 24, 1893.

Alsen's Portland Cement.

The strongest, finest ground, and most uniform Cement in the world. Permits the admixture of more sand than any other, and is the best for mortar or stuccoing.

143 Liberty Street, = = New York.

Peerless Mortar Colors,

RED, BLACK, BROWN, AND BUFF.

Our New Colors are novel and attractive and well worthy of attention. MOSS GREEN, ROYAL PURPLE, POMPEIIAN BUFF, FRENCH GRAY, COLONIAL DRAB.

All Colors Permanent and Superior to any Article in Use.

SAMUEL H. FRENCH & CO.,

Painters' and Builders' Supplies,

ESTABLISHED 1844. PHILADELPHIA, PA.

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LAWRENCE CEMENT CO.
No. 1 BROADWAY NEW YORK.
SUPERIOR FOR WORK UNDER WATER
STANDS EVERY HIGH TEST
ADAPTED FOR HEAVY MASONRY
"HOFFMAN" ROSENDALE
MADE FROM THE BEST ROCK
ALWAYS RELIABLE
UNIFORM IN QUALITY
STRONGEST OF AMERICAN CEMENTS

CLEVELAND IRON ORE PAINT CO.

C.I.O.P.CO.
TRADE MARK

MANUFACTURERS OF
HIGH GRADE
MORTAR
COLORS,
ALSO,
Metallic and Graphite Paints,
IN ALL FORMS.

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Cleveland, O.

THE MASON CONTRACTOR.

A Department conducted in the interests of the Builder, and the Contractor for Brickwork.

CONTRACT AND CONTRACTOR.

AMONG the many features of the building business which are susceptible of improvement are the uncertain and inferred requirements from the builder in the execution of a contract under the present methods of competition. It is customary for a contractor to sign an agreement to erect a building according to certain specifications and drawings, to supply all material, and perform all work "*incident thereto*," whether mentioned in the specifications or shown on the drawings or not; the architect to be the sole judge as to what is *incident* to the completion of the building. Granting that in all cases the architect intends to be perfectly fair, the existence of such a condition in a contract makes the agreement unjust, as it places in the hands of one party the power to require an unknown quantity of labor or material, or both, from the other party. The architect may maintain with much force that certain things are incident to the completion of a building, and the contractor may maintain the reverse with equal force; and yet the contractor is expected to accept the decision of the architect as final.

The contractor is asked to accept as final an interpretation by the architect of his own specifications and drawings, which interpretation the architect was unable or unwilling to give the contractor when the specifications and drawings were submitted to him as the means for estimating the cost of the proposed work. In no other business does such a condition of affairs exist, where one party to an agreement agrees to do a certain thing for a certain sum of money, and at the same time gives to the other party the power to make such interpretation of the work incident thereto as he sees fit, after the cost has been based upon certain definite descriptions and certain definite drawings. The bone of contention lies in the fact that there is opportunity for such an interpretation of the specifications and drawings as may subsequently force the contractor to do more work than was demanded by the interpretation given the specifications and drawings at the time they were submitted for estimate. While we should work for the complete establishment of the principle that, if any portion of work *cannot be definitely described or shown at the time estimates are asked for*, then it should be left entirely out of the calculations until it *can* be so described or shown, it is evident that until this reform is secured there is need for the establishment of some method whereby the contractor may be assured greater equity in the premises. When there is necessity for interpreting the drawings or specifications, the contractor should not be forced to accept any interpretation without appeal. One way in which this inequality might be overcome is through the establishment of boards of reference to which questions at issue may be submitted. A permanent board of reference, composed of three men who are familiar with building operations, could be created by the architects and builders in any city. One member could be appointed by the architects, one by the builders, and a third appointed by the two thus chosen. This board could be appointed at the beginning of each year, and should be accessible at any time for the settlement of disputes under building contracts. Regular fees could be established, and builders and architects would thus have a fair means of adjustment of all questions at issue which they are willing to submit to arbitration.

Special boards of reference could be created for each contract by mutual agreement between the contractor and the owner, or his agent, the architect. Each, acting independently, should select one representative, and a third person should be selected by mutual agreement; the three thus selected to form a board of reference, their names and the object of their appointment to be incorporated into the contract before it is signed. By this means litigation would again be avoided, except as a last resort. These boards would not be active except in case of need, when the contractor and architect could not agree as to what might be justly considered incident to the completion of a building. Many complications which now arise would be avoided through the existence of fair and honorable means for obtaining unbiased opinion upon all contingencies that might arise during the execution of a contract. The appointment of such boards would require comparatively little effort, and the result would greatly simplify and improve the conditions under which building contracts are executed. The existence of such means of settlement need not delay the progress of work, for it could be provided that the architect's interpretation could be carried out and the adjustment of amount of additional allowance to or deduction from the contract would then become the matter to be adjusted by the board.

The present custom of interpreting drawings and specifications is inherently unfair, notwithstanding the fact that many buildings are annually erected without serious difference between the contractor and the architect; the contractor is allowed no voice in the settlement of questions that are of vital pecuniary interest to him. Contractors have always submitted to a large amount of injustice in the demands made upon them, but there is no good reason why they should continue to do so.—*Bulletin of the National Association of Builders.*

GEOMETRICAL PATTERNS IN BRICKWORK.

I.

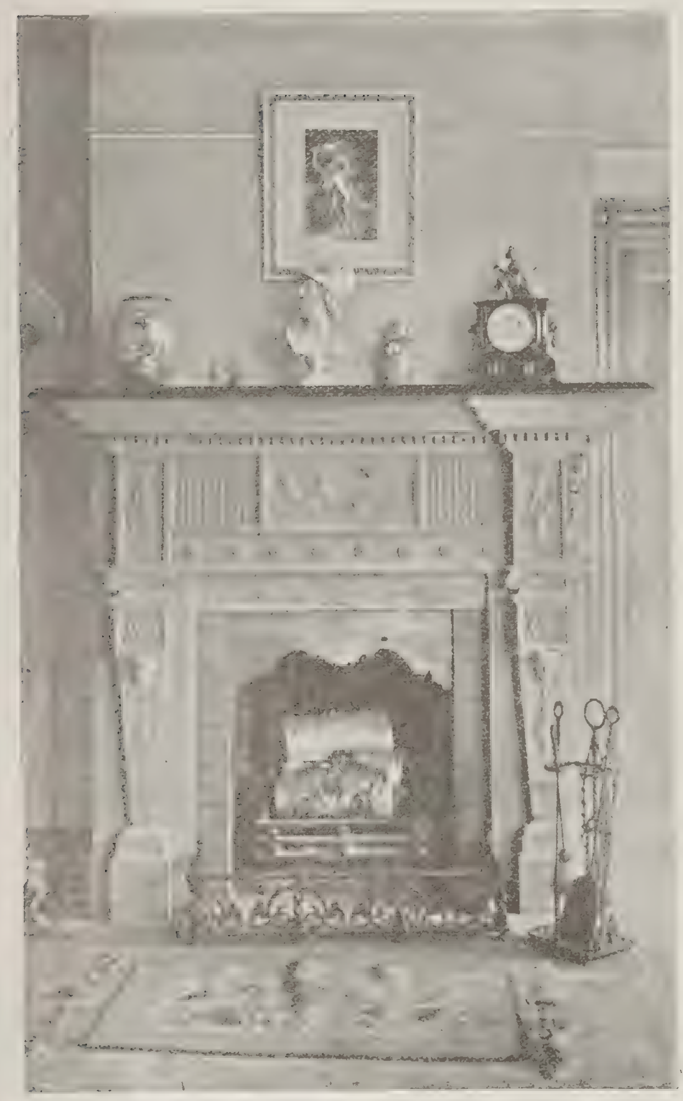
AMERICAN BOND WITH TWO COLORS.

(*Continued from October.*)

ON Plate 86 we give ten more examples of geometrical work with stretchers. These are of the same general character as those given in the last number. Of course, the number of combinations is endless, but there is danger in departing too far from the simpler designs. The diamond motive is the most useful by all odds, as comparison of the three designs this month and the two given last month will show.

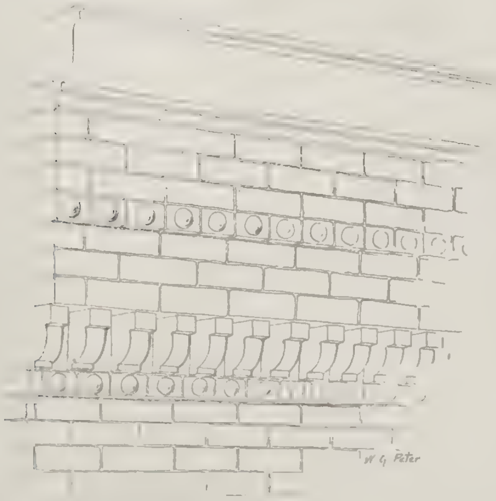
When Roman shape brick are used and laid so that the joints come in the middle of the bricks above and below, the same pattern will apply, but of course the effect will be to greatly flatten and elongate the designs. Again let us caution readers who are not accustomed to using these patterns to avoid strong contrasts. Some of the best effects are secured by sorting one lot of brick, and even then softening the effect by laying middle-shade bricks here and there so as to tone down the dark or light bricks.

VERY often a builder is in need of some circular ornament, such as a medallion, to fill a place in the spandrel between two arches. The terra-cotta companies are constantly being called upon to execute such work for the finest buildings, and their designers and modellers are extremely facile in this direction. This, for instance, was made by the New York Architectural Terra-Cotta Company, of 38 Park Row, New York City, for the American Theatre, New York. While the company might not duplicate this design, it can readily supply others equally satisfactory. In the preceding pages of this number will be found other details of terra-cotta work, panels, capitals, etc., and a number will be published in each issue. For a list of the leading terra-cotta companies, the reader is referred to the advertising pages in the front of the paper.



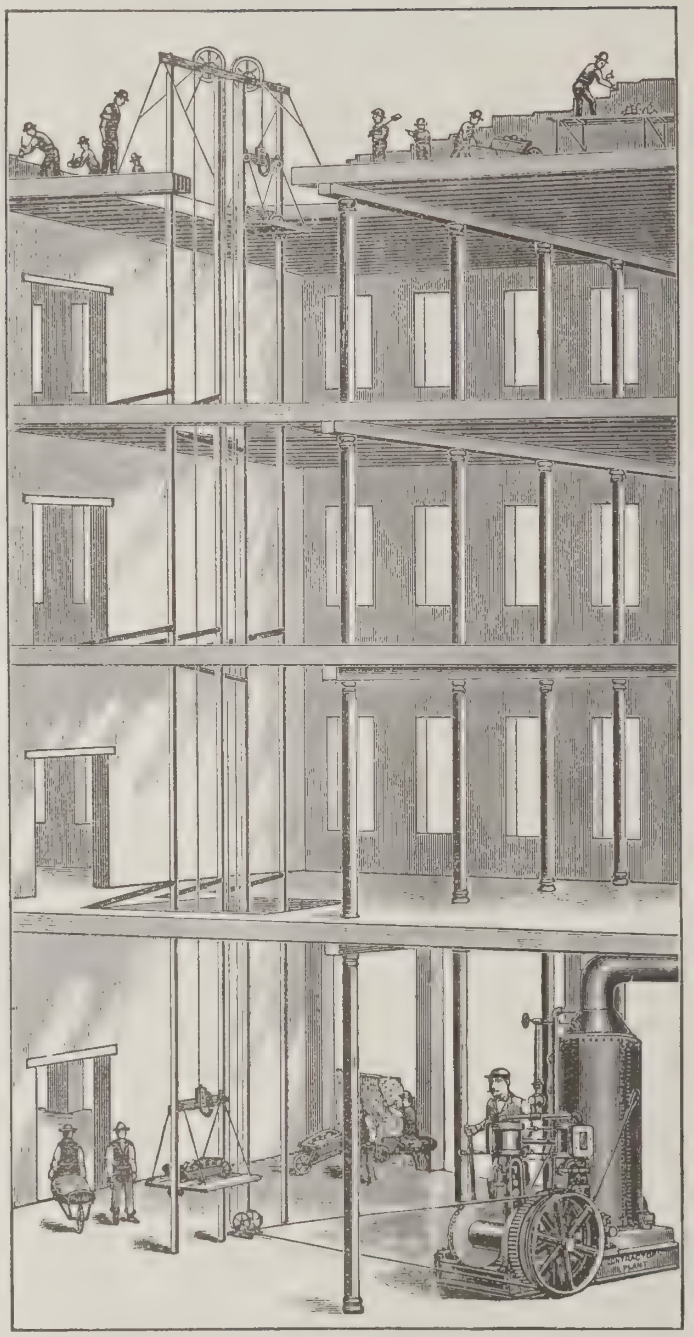
A TERRA-COTTA MANTEL.

THE above photographic reproduction shows an example of terra-cotta used for domestic interiors. This design is after the Colonial style, now so popular in modern American architecture. It was executed by the Glens Falls Brick and Terra-Cotta Co., of Glens Falls, N. Y. Mr. Chas. Scales, the secretary, will be glad to give estimates for this class of work.



A SUGGESTION FOR A MOULDED BRICK CORNICE.

OUR prospectus for the coming year will be printed in the December number.



Builders' Portable Material Elevator.

A most complete outfit for the elevation of materials. Will supply 100 masons with material on almost any height of building. Two balancing cages leave only weight of material to be raised. Changes made from floor to floor easily and quickly. The engine is complete with boiler, injector, safety-valve, steam gauge, and all connections, and is mounted on a steel frame. It has double cylinders, with reverse motion and friction drum foot brakes. Entire outfit is compact, easy to move, and simple to operate. Estimates and full particulars furnished upon application.

FOR DERRICKS, WINCHES, ENGINES, AND ALL CONTRACTORS' SUPPLIES, GET OUR ESTIMATES.

Contractors' Plant Mfg. Co.,

129 ERIE STREET, BUFFALO, N. Y.

THE MANUFACTURER.

A Department devoted to the Market Side of Clay Production.

ARCHITECTS AND BRICKMAKERS.

EDITOR OF THE BRICKBUILDER:

Sir, — The kindly effort you have shown in your endeavors to bring the brick manufacturer in closer touch with the architect, to teach the factor of clay that there is a market for products he would never have thought of had it not been for you, is, to say the least, commendable, and yet I doubt whether the brick manufacturer will either comprehend or appreciate your intentions. The maker of bricks, generally speaking, is not a brilliantly progressive creature. His chief ambition is to make those articles *demanded by the trade*. He objects to innovations and dislikes making experiments; and yet he does experiment in an aimless way, which results in nothing practicable. His most important "discoveries" are the result of accident, as witness the so-called "Pompeian" and "rain-washed" bricks; instances which illustrate all too well how eager "the trade" is to take up with anything new, no matter what may be its merits.

On the other hand, "the trade," or really the architect, is constrained to purchase or specify only those products which are presented to him.

He may dream of broader textural effects and wider possibilities of color treatment, but his dreams are negatived by the impossibility of procuring the material he desires, for the simple reason that "the trade" has not before demanded it. It might be considered as a very true axiom of business generally, that it is difficult to purchase those things which are not made.

Taking up your suggestions regarding the "common" brick made one and one half inches wide, while they would be exceedingly difficult to make, I agree with your numerous architectural correspondents that they would add a charming diversity to brick construction, providing they were properly used and their limitations fully understood.

It is quite probable, however, that the ordinary architect would require them to be made with the same mathematical precision which literally "knocks the stuffing" out of most of the brick construction erected in this country.

It would be almost impossible to so produce them. Thank God! they would warp and twist so that they would have some individuality of their own, so that it would be necessary to allow them to possess a joint which should show some reason, some excuse, for their existence as the *complimental* part of a wall or structure.

As a matter of fact, in these later days — possibly since the invention of sandpaper — the idea seems to obtain that the seam or joint in brick construction should be hidden, concealed, eliminated as far as possible; that this is something to be ashamed of; that it is necessary to grind the edges of the bricks or color the mortar, so as to convey the idea that "in this particular wall there are no joints."

How absurd! how ridiculous this idea is! and yet how common. *The primal part or portion of every brick wall is, and must be, the cement or mortar, — the bricks are only complementary.*

It is perfectly feasible, and has been for ages, to build an entire structure of cement or mortar without the assistance of any other material, making it not only weather and climate proof, but architecturally beautiful as well. Can this be done with bricks alone?

The ancients understood brick structure, oh, so much better than we! and as we have to go back many centuries to arrive at the basis of mathematics, as we have to learn from antiquity the primal laws of form and color, — which mean architecture, — so have we to turn in retrospect to earlier ages to learn what brick architecture really means; to comprehend and understand that not only is the joint a part of the structure, an important part, an integral part, but that as a matter of fact the effect obtained in brick construction, artistically considered, is not so much dependent on the color of the bricks used as it is upon the wisdom shown in the definition of the *joints* and the honesty with which they are treated.

H. E. STREETER.

BOSTON, Oct. 30, 1894.

BRICK FOR FENCES.

BRICK is the only material for fences or walls that improves with age. Wood rots, or breaks, or the posts get loose and the fence looks "wobbly." Iron rusts. Both are a continual expense for painting, and must be rebuilt every few years. Stone is very expensive, and many varieties disintegrate badly. A brick wall can be so designed and built that it will improve year after year, be absolutely no expense after the building, and, last but not least, it is a new market for just so many brick.

LOCAL ADVERTISING

II.

A SERIES OF SUGGESTIONS FOR THE AVERAGE BRICKMAKER.

MANUFACTURERS of front brick or of a good quality common brick cannot help getting their brick into one or more handsome buildings. Photographs of such buildings are always appreciated by people in the town, and are of interest to those of neighboring places. A good photographic reproduction would be almost certain to find a place on walls of law, insurance, real-estate, and general business offices, if some care were taken in placing it. Such photographs would find a place where finely lithographed advertisements lacking local interest would not. Suppose the building in question is a church. A thousand heliotype prints on 11 x 14 paper, with your printed advertisement, and a metal eyelet to hang up by, would cost about $40. These would thoroughly cover your immediate territory and be a standing advertisement for a year, on an average. Wherever hung up, they would attract attention. When any person steps into a business office and for some reason has a moment or two to wait, the first impulse is to examine the nearest picture or lithograph or illustrated advertisement displayed upon the wall. With several attractive subjects, covering a variety of buildings, the wide-awake brickmaker for a couple hundred dollars can most thoroughly advertise his business locally.

BLACK HEADERS.

THERE is a rapidly increasing demand among architects for black headers, which, used alternately with red stretchers in Flemish bond, with broad white mortar joints, are all the rage. We heard not long ago of a brickmaker who had taken a contract to furnish more black headers than he had in stock. "Standing in" with the mason contractor, stock was quickly made, with a pot of black paint. Through careless superintendence, the job got through without getting spotted by the architect. The black headers were used to form a pattern on the plain wall surface. The paint was none too good, and rather hastily applied, and as a result the pattern has almost disappeared, except as the white mortar indicates a difference in the bond.

BRICK CORNICES.

THE Special Cornice number of THE BRICKBUILDER contains forty-five designs for brick cornices from seven to twenty-one courses high. It is a good thing for every brickmaker to have on hand. Price twenty-five cents.

TRADE NOTES.

Yard Equipment.

MESSRS. C. L. BIGLER & CO., brick manufacturers, Harrisburg, Pa., will probably enlarge their plant to three times its present capacity, requiring new machinery, kilns, and drying outfit.

WE are in receipt of a letter from the Standard Dry Kiln Company, Indianapolis, calling our attention to an article that has recently appeared in some of the journals respective of a dispute regarding control of patents of the Reliance Kiln. The Standard wish it known and distinctly understood that there is no dispute as regards these valuable patents; that they are wholly controlled by the Standard Company, and any question to the contrary originated from a desire to injure the Standard Company. We congratulate them on the fact of having taken active measures to counteract any such reports.

Clay Materials.

THE NEW BRITAIN ARCHITECTURAL TERRA-COTTA COMPANY is producing some very handsome designs for the Science Building at the University in Burlington, Vt. This is one of the largest contracts the company has secured in New England, and we trust the late fire at their works will not seriously hamper the delivery of the material.

THE turn over of the manufacturing plant and real estate of the Anderson Pressed Brick Company should be productive of the result of placing that company on a good financial basis, and enable them to produce their bricks at prices that will make them available to the market and show a profit to the company. We understand the property has been purchased by Mr. Worman D. Fraser, for $160,000, on behalf of the mortgagees, who will carry on the works.

THE death of Mr. William H. Pfingsthorn, secretary and treasurer of the American Enamelled Brick and Tile Company, Mohawk Building, New York, which at the time of Mr. Pfingsthorn's death was engaged in equipping a new plant at South River, N. J., will in no way interfere with the plans of the company, who are now pushing to completion their new works and expect to place their enamelled brick upon the market not later than Dec. 1.

THE SOMERSET & JOHNSBURG COMPANY, Boston, are supplying the enamel brick in the tunnel of the Franklin Street subway at Allston, Mass. These very fine specimens of good enamel have called forth some very favorable comments. The general design of laying of the different colors is worthy of mention, since it seems to set off each by contrast. Three courses of light-brown enamel brick, two courses of white, one course of brown, twenty courses of white, and two courses of brown as capping. The effect is very pleasing, and in the opinion of most a great deal more desirable than that of the plain white enamel brick used alone.

BIRMINGHAM, ALA. — Mayberry & Watson Company, corner 20th Street and Powell Avenue, press brick, fire brick, and clay, terra-cotta, etc.; new firm.

Miscellaneous.

THE new "Castle Square" Theatre, Boston, has been equipped with thirty Guibert swinging hose racks.

THE STURTEVANT MILL COMPANY, 70 Kilby Street, Boston, report the largest shipment of their well-known Rock Emery Mill Stones ever made to any one party in the South. The invoice referred to was two thousand Rock Emery Mill Stones, assorted sizes, to J. B. Speed & Co., Louisville, Ky. The company further report good business in their line in the South and East, with but very little activity in the West. The numerous inquiries they are receiving for goods for the spring trade in that quarter would promise for much improvement early in the new year.

ST. LOUIS, MO. — The Wimple Terra-Cotta Company, Mauch & Pierce, have given out contract for the erection of a new $4,500 factory building.

SPENCER, MASS. — William A. Barr & Sons, brick manufacturers, are erecting a new factory building on Wall Street.

A CHANCE

OF A

LIFETIME.

A gentleman familiar with the building material trade and with from $10,000 to $15,000 to invest can obtain an interest in a successful business in building material, covered by United States patents, and secret process; has proved very remunerative in England, France, and Germany, and will bear closest investigation.

Address

HENRY S. CRABBE,

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THE SIMPSON BRICK PRESS.

The only American brick machine to receive
official recognition from the authorized judge
on brick machinery at the . . . . . .

WORLD'S COLUMBIAN EXPOSITION.

It is replete with time and labor saving devices, and its product always commands the highest market price by reason of their beauty and hardness.

In no single detail of its *simple*, *powerful* and *ingenious* mechanism is this press susceptible of improvement. We are also manufacturers and dealers in full brick-yard equipments, and are prepared to estimate on and construct complete plants. We are also prepared to test all brick-making material sent to our address in Chicago. For prices, terms and other information, address,

THE SIMPSON BRICK PRESS CO.,

No. 415 Chamber of Commerce Building, - - - - Chicago, Ill.

Agents for Canada, WATEROUS ENGINE WORKS CO., Brantford.

THE BRICKBUILDER

Vol. III. BOSTON, DECEMBER, 1894. No. 12.

BRICK AND MARBLE IN THE MIDDLE AGES.

THE CITY OF PADUA.

CHAPTER VII.—Continued.

G. Edmund Street.

PADUA, when I first saw it, seemed to me to be a most melancholy city; grass grew in the streets, the footways were all formed under dark and dismal arcades, and not only the external of the half-occupied palaces, but those even of all the houses, looked squalid, dirty, and miserable; nor was there any relief when one got into the more open spaces, for the large piazza on either side of the Palazzo della Ragione, or town hall, looked as squalid and uncared for, as dirty and unprepossessing, as they well could; nor was this universal squalor rendered at all less remarkable by the fact that Padua rejoices in a *café* which is said to surpass any other even in Italy, for its smartness; and the array of well-dressed gentlemen who frequented it certainly made the neighborhood look more wretched by contrast than it otherwise would.

THE ANNA CHAPEL, PADUA.

The Caffe Pedrocchi was, however, soon passed, and our first object was the Palazzo della Ragione,[1] whose vast and singular hall, about two hundred and fifty feet long by ninety feet wide, is one of the greatest architectural curiosities in the city. Its exterior has been modernized, so that now it is only remarkable for its long expanse of roof, but the interior is still in its original state. The access to the hall, which in this and other respects much resembles that at Vicenza, is from external arcades on the first floor, to which four staircases lead from below. The walls are low, and covered with paintings arranged in arcaded panels; some of these are said to be by Giotto, and the whole of them, I believe, were at any rate painted in his time, but have probably been repaired and retouched extensively long since. The windows are small, low down in the walls, and admit scarcely more than sufficient light for the lower part of the hall. The roof shows in section a vast pointed arch of timber, boarded and divided into panels by a succession of heavy vertical ribs scarcely at all moulded. The construction is obviously so weak as, from the very first, to have made the iron ties which hold it all together absolutely necessary. A curious feature in the design is, that instead of having gable walls the roof is hipped, and shows therefore at the end just the same section as at the sides. What little light finds its way into the dark obscurity of the roof is admitted through some small dormers high up in its framework. The effect of the hall is gloomy, and, compared to our own great halls, certainly shows some lack of knowledge of construction on the part of its architect, and its bald heaviness makes it absurd to compare it to our own noble Westminster hall, though their very similar dimensions might naturally tempt us to do so. It dates from about the beginning of the fourteenth century, and the story runs that it was designed by a certain Frate Giovanni, who, travelling in India, saw the roof of a great palace the construction of which so pleased him that he brought back drawings of it with him, and erected its fellow here in Padua. How much truth there is in this tradition I cannot say, but this much seems clear, that in some way Padua has, if not a very beautiful, at any rate a very remarkable Sala, and one which is quite unlike any other room in Europe, with the single exception of the corresponding room at Vicenza, which was no doubt copied from it.

It has been burnt and damaged in one way and another repeatedly since it was first built, and in the course of the restorations the paintings on the walls have been excessively damaged, in many parts repainted, and in some obliterated altogether. The work was commenced, at any rate, if not completed, just at the time that Dante and Giotto were together in this part of Italy. The walls are all divided into four panels in height by borders, with painted pilasters for vertical divisions, and the panels are generally arched and cusped. The paintings include the apostles, the signs of the zodiac, representations of the months, the planets, and the constellations. The whole scheme is far too complex to be intelligible without a key. This fortunately is accessible in the very careful and complete account of all the subjects of the paintings on the walls which was prepared in 1858 by Mr. W. Burges, and printed in the "Annales Archéo logiques." With infinite pains he made out the meaning of the whole of the figures,—no light task, as, the walls being divided by painted borders and arcades into several stages in height, and an almost interminable number in length, spaces are provided for some four hundred subjects.[2]

At one end of the hall was the chapel of San Prodoscimo, formed, I presume, by screens. The judges sat round the hall, forming so many courts in one room. At the opposite end was a cage, or prison, so that here, under one roof, with walls covered with illustrations, sat all the courts of Padua, without any of those ingenious divisions and subdivisions which are now necessary for the administration of the very smallest sort of justice, and, it may be hoped, with as much honesty as there certainly was simplicity.

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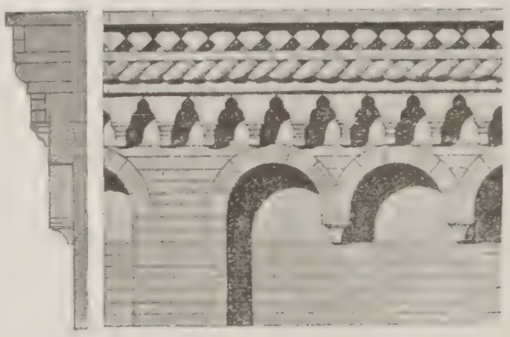
[1] A half-page photograph of this was published last month.—Ed.

[2] See also "Pietro Brandolese, Scultura, Pittura, etc., di Padova," Padova, 1795.

Nowadays the hall is quite unused, save as a receptacle for lumber, of which the most remarkable example is the remnant of a gigantic horse made by Donatello to travel on rollers in some old Paduan pageant.

From the Palazzo della Ragione we found our way to what must, so long as it lasts, be the great glory, as it is the chief charm, of Padua,— Giotto's Chapel, founded in 1303.

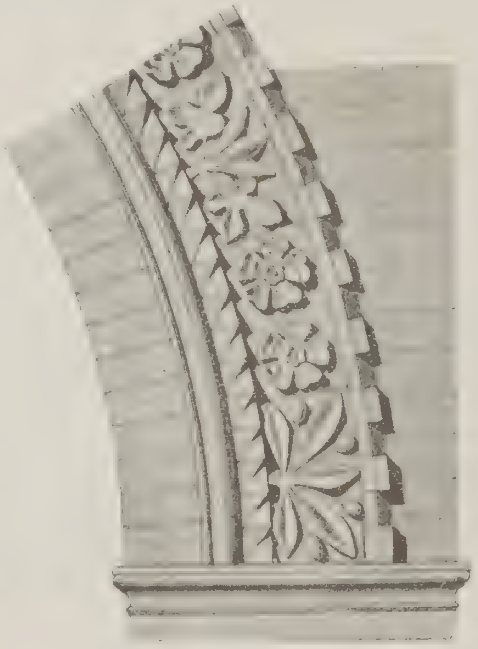
This stands in private grounds, and on one side of a desolate green walk which leads up to a private house, to which it now forms an appendage. From the first it was a little private chapel, and in no respect remarkable for size or costliness of material or design. The plan is a simple oblong nave with an apsidal chancel, and a sacristy on the north side; and nothing can be simpler than the exterior. The walls are of brick, divided into bays by narrow pilasters. The west door is round arched, as are also the windows. The interior is even more simple; the whole nave has not a moulding, the walls are continued on into the semicircular ceiling without any cornice, and all the ornament is added in color.



CORNICE. S. CHIARA. PADUA.
Supplementary Illustration. (From Strack.)

The windows all have a deep splay outside, very simple stone traceries, and glass fitted to wooden frames placed inside against the stonework. There seem also to have been shutters outside, for which the hooks still remain. A sort of pent-house, or perhaps a cloister roof, was carried along in front of the chapel, but of this naught remains but the corbels which carried it. There is no more to be said about the exterior than that it is simple and good of its kind, the kind being very humble.

Let us go inside, and we shall pass a very different verdict. Giotto is to many of us not only a person singularly gifted in a great age, but in some sort the embodiment of an idea. The idea is that of an artist, pure, simple, and direct in his work, who should excel equally in all the arts, and show, even though his work be an exception to all rules, the consummate success of such a course. The man was fortunate in his day and in his friends. Here, where we stand to admire, he painted, whilst probably Dante looked on. For merely human and artistic interest there is, therefore, no room which more rightly deserves to be the object of endless pilgrimages; and there is none in which one will find the artist more faithful to his calling, more full of recollection and self-restraint than in this.



ARCHIVOLT. S. FRANCESCO. PADUA.
Supplementary Illustration. (From Strack.)

I know, therefore, no one building, of such very small size and cost, which can claim the same degree of interest as this small Chapel of the Arena. It is, indeed, one of the glories of art that the works of its great masters cannot diminish in value, or even be competed with by subsequent masters: when once done, they are done forever; and so the Pietà of Giotto, in this little chapel at Padua, is now — as it was when first painted in the commencement of the fourteenth century, and as it will continue to be so long as the neglect with which it is now treated allows it to exist — one of the great paintings of the world, one of those fountains from which school after school and age after age of artists may drink instruction and knowledge, and never fail to gain more the more they study its many excellences, and its intensity of feeling and conception.

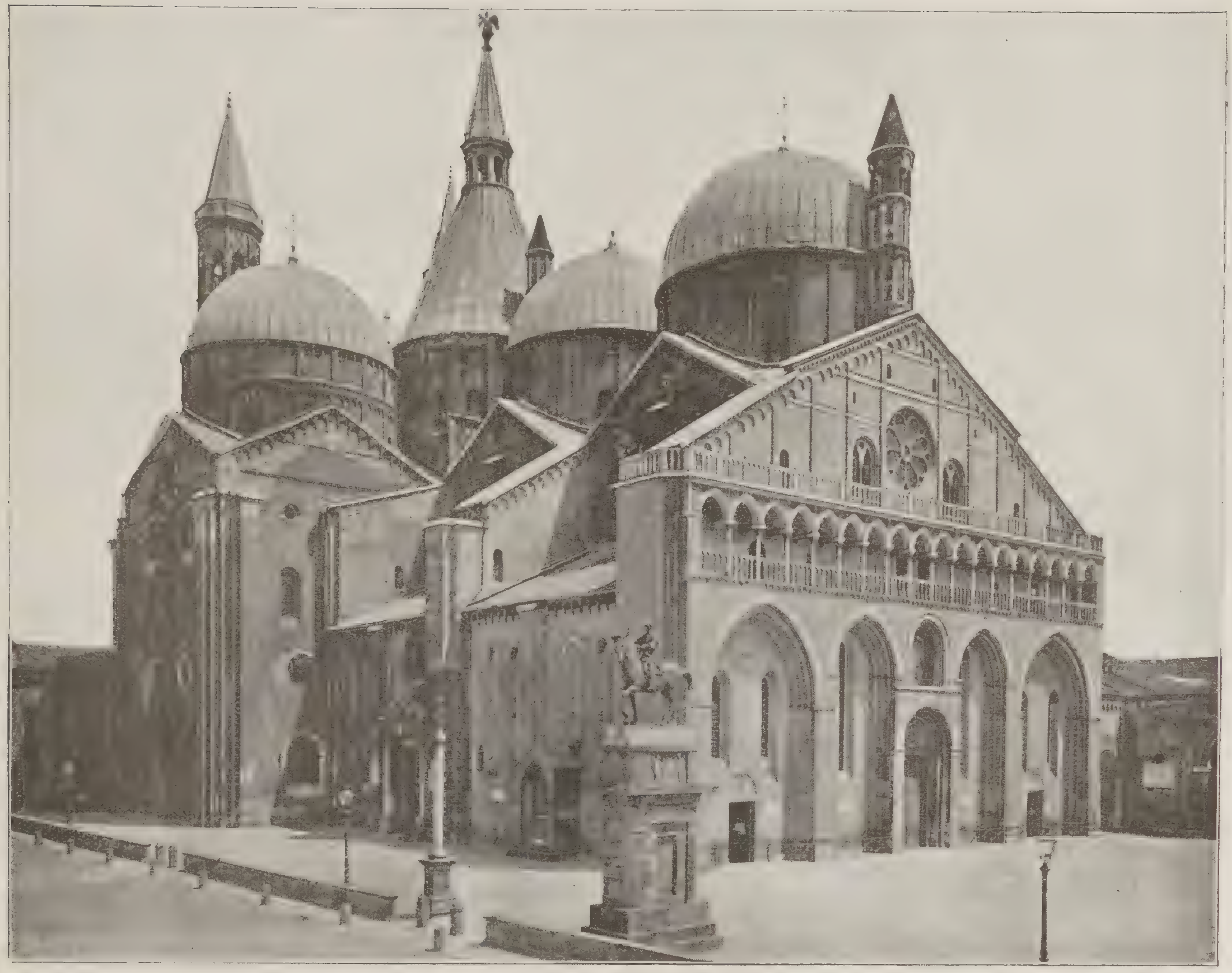
The architectural portion of the interior may be first of all described. The apse is simply a sanctuary, and the chancel is formed by marble screens on each side of the nave, leaving a broad entranceway between them, and enclosing about one third of its length. Against the west side of these screens are altars, each with a small carved marble reredos; whilst on the east of them are steps leading to the two ambons; that on the north being a book rest, carved in marble, and fixed with its face to the east; that on the south of iron, and turning upon a pivot. Between these screens and the sanctuary arch are modern stalls on each side. The sanctuary has seats all round the apse (except in the eastern bay), each with a delicate white marble canopy. The sacristy is groined, and has a thirteenth-century press of wood of a design rather curious than beautiful, but very rich in its detail. In the nave, as I have alredy said, the walls have neither cornices nor stringcourses to break their even surfaces, and their face is continued on in a semicircular wagon vault. There are six lancet windows on the south, none at all on the north, and a three-light window very high up in the gable at the west end above the doorway.

The architectural merit of the building is simply, I think, that it performs satisfactorily the office of giving ample unbroken surfaces of wall for paintings.

The arrangement of these is very regular. The vault is divided into two parts by wide colored borders, the space between which is painted blue, powdered with gilt stars, and in each bay there are five small medallions with figures on a gold ground. The side walls are divided by borders into three divisions in height, the upper division containing subjects from the life of the Blessed Virgin, the central, those illustrative of the life of our Blessed Lord, whilst those nearest to the ground are representations of the Virtues and Vices opposed to each other, — the last division tinted only in one color, the others richly painted in bright colors upon a field of blue.

The borders which divide the paintings are very well designed, their patterns being always very clearly defined with white leading lines, and a line of red on either side always accompanying each line of white. The paintings themselves are very wonderful; there is an earnestness of purpose and expression about them such as one rarely meets with. Each subject is treated with a severe conscientiousness, not always conventionally where a departure from strict rule is for any reason necessary, but still, generally speaking, in accordance, no doubt, with the ancient traditional treatment. This, illuminated as it is by the thought and love and earnest intensity of feeling which Giotto lavished on all that he did, makes his work here the most perfect example of a series of religious paintings that I have ever seen. Of course in such a large series of subjects there must be great variety of excellence, and I am content to agree with the rest of the world in awarding the palm of excellence to the Pietà, in which the expression of intense feeling in the face of the mourners over the body of our Lord is certainly beyond anything of the kind that I know.

The series is very complete, and, beginning with the history of Joachim before the birth of the Blessed Virgin (the seventh subject),



CHURCH OF SAN ANTONIO AT PADUA. See Plate 87.
Supplementary Illustration to "Brick and Marble in the Middle Ages."

is continued down through the leading acts of our Lord's life to the descent of the Holy Ghost on the day of Pentecost;[1] whilst the west wall is occupied by a Last Judgment, and throughout the subjects our Lord, the Blessed Virgin, and the Apostles are always represented in vestments of the same color.

Most of these paintings are in very perfect condition and the *tout ensemble* is nearly as charming as it was when first painted. I was sorry, however, to notice some of the paintings lined all over by a recent copyist, and much damage has been done by damp, especially in the Last Judgment on the west wall. I do not care very much for the painting on the lower part of the walls. The figures of Virtues and Vices are very finely designed, but the imitations of marbles and mouldings painted in perspective were, I hope, being the last work to be finished, done after Giotto had completed his work.

Close to Giotto's Chapel stands the great and, to an English eye, singular church of the Eremitani. It has a very broad nave of immense length, unbroken by aisles, and roofed with one of the cusped roofs already noticed at Verona, in which the real construction is (with the exception of the tie-beams) entirely concealed by boarding on the under side, this boarding being generally arranged in a succession of large cusps or curves. The effect here is, I think, very heavy and unsatisfactory, but we must bear in mind that the span is prodigious, and the pitch of the roof very flat. The chancel and an aisle on either side of it open into the east end of the nave with three arches, and look so small as to be more like mere recesses than important integral parts of the plan. There are in this church a great many frescos and paintings of much interest, among which are some by Mantegna, in a chapel on the south side of the nave, which are worthy of careful study as being, probably beyond almost any other wall paintings which exist, an evidence of the fact that interest in treatment of subject, drawing, and design of consummate excellence, perspective and decorative coloring of the walls, may all be included in a fresco without interference with the wall surface, or indulgence in tricks of chiaroscuro, without which no painter now seems willing to do his work. Yet if Mantegna cheerfully accepted such rules for his wall painting, would it be beneath modern painters to do the same for theirs, and could they ask for a better teacher or guide than this consummate artist?

Less interesting to the artist than these works of Mantegna are the paintings in the apse executed by Guarienti in the middle of the fourteenth century. Here are figures of the planets, the Sun, Moon, Venus, Mercury, Mars, Saturn, and Jupiter, each with allegorical figures, male and female, of the Seven Ages of Man influenced by the planets.[1]

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[1] Since this was written the whole of these subjects have been published by the Arundel Society, and Mr. Ruskin's notice of them has also been given to us. They are very valuable as exemplifying, as well perhaps as colorless engravings can do, the exceeding value and originality of this series of paintings. It is to be wished that they may produce some effect upon the minds of our modern artists, who much require to take home to themselves the lesson of sincerity and earnestness of purpose, combined with the highest kind of subject, which Giotto so eminently exhibits in all his works. An extremely good series of photographs of the whole of these paintings may now also be obtained in Venice.

At the west end of the nave is a great painted rood, one of those curiously shaped crosses meant to receive a painting of the Crucifixion instead of a carved figure, and cut round with quaintly carved and cusped indentations, of which so many examples remain, though they are generally found now in picture galleries. This no doubt stood originally on a rood beam, where one sees such a rood represented in one of the wall paintings in the upper church of S. Francis at Assissi.

When I was last at Padua the west front of this church was being repaired, — a very dangerous and terrible operation in Italy, where, so far as I have seen, there is less feeling for, or knowledge of, Gothic architecture than in any other part of Europe. The interior, too, has been ruined by the way in which the old ceiling has been painted, in blue and shaded white. In a building whose characteristic feature is a certain grand simplicity and austerity, it is especially disgusting to see light and tawdry coloring introduced, seeing how completely out of harmony with the whole idea of the church it is.

At the west end are some fine monuments of stone and marble boldly corbelled out from the wall, adorned with good carving of foliage, and angles looking out from circles.

The east end is less altered than any part of the exterior of the building. The immense gable of the nave is divided into four parts, the outer of which have lancet windows, whilst in the centre is an insignificant apse, which is almost exactly repeated on the east side of the south transept. The large sacristy on the north side and a campanile of not much interest on the same side redeem, to some extent, what would otherwise have been a most uninteresting elevation. The windows here have a wide external splay, semicircular arches, and stone trefoil heads inserted rather clumsily under the arches.

What a grand idea it was on the part of the preaching orders to build these enormous naves for their congregations! Here, when enthusiasm for preaching was newborn and general, a congregation, numbered rather by thousands than by hundreds, may have gathered round the preacher, all within sight of him, and, with the aid, probably, of an awning stretched across the church over the pulpit, all within sound of his voice.

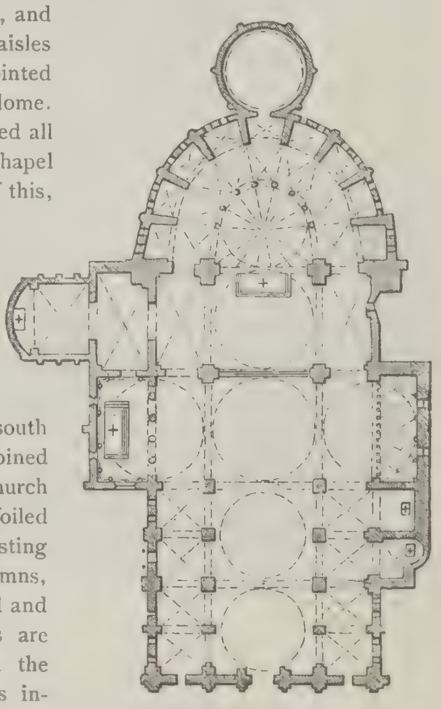
From the Eremitani we found our way, with some difficulty, through miserable streets to the church of Sant' Antonio, probably the most remarkable architectural work in many respects in this part of Italy.

It seems that about A. D. 1231 it was determined to erect a great church in honor of St. Antony, the patron of Padua, and Nicola Pisano, then one of the most eminent men of his day, was sent for to undertake the work.[2] The view of the exterior which I give will best serve to show in how singular and original a manner he accomplished his work. St. Mark's, at Venice, must have been in his eye when he designed his church, and the crowd of cupolas which form its roof remind one forcibly of its most distinguishing feature.

On first sight Sant' Antonio certainly does not prepossess the beholder in favor of such a bold departure from every-day rules of art. It is built almost entirely of a light-red brick, not much better than the common London brick in color, a poor material wherewith to attempt the construction of a noble church. Stone is used very sparingly in the voussoirs of the arches and elsewhere. The cupolas are heavy in their effect, but relieved by that over the intersection of the nave and transepts, which rises higher than the others, and is certainly striking in its design and outline, which is, for the main portion of its height, that of a simple cone. Round and pointed arches are used indiscriminately, and the walls are divided everywhere by pilasters, and surmounted by arcaded corbel-tables, in all these respects giving the building the appearance of being much earlier than it is. The west front is very peculiar, and recalls the fronts of the churches in Vicenza which I have described, and is entirely unlike any of the churches of Pisa, which would hardly have been the case had it really been designed by Nicola Pisano. One great flat gable with an arcaded eaves-cornice finishes the whole, and out of its apex rises a tall polygonal turret, almost as high as the dome in front of which it stands. The lower part of the west front has a central entrance of mean character, and on either side two unequal arches of construction, the walls within which are pierced with windows. Above these, and just beneath the great pediment-like gable, is a long arcade of simple pointed arches, behind which a passage and three windows opening into the church. This front is a sham front, and not excusable on account of its grandeur or its beauty. Indeed, had it followed the outline of the fabric, it would have been neither ungainly nor heavy, both of which it most assuredly is now.

The interior is striking from its height, but cold in the extreme in effect; the domes are all whitewashed in the brightest and freshest manner. The plan gives three domes to the nave, one and an apse of seven bays to the choir, and one to the transept. The aisles open into the nave with pointed arches — two to each dome. The choir aisle is continued all round the choir, and a chapel is thrown out to the east of this, which is again crowned with a dome.

The north transept contains the chapel of the patron saint, full of gorgeous ornaments of all kinds, but not very ancient. Opposite it, in the south transept, is a curious groined chapel, divided from the church by five-pointed and trefoiled arches of yellow marble, resting upon classical-looking columns, and all very richly painted and inlaid. Above the arches are five statues in niches, and the intermediate wall surface is inlaid with white and red marble in a regular pattern, such as we have seen in the pavement of Sta. Anastasia at Verona, with very good effect.


PLAN OF SAN ANTONIO.

The cloister on the south side of the church is very large and good, and some fine arches occur in it, composed of black and yellow marble with bricks of varied color introduced. On its east side three open arches, filled in with a double iron grille, open into what was, no doubt, the chapter-house. Going from this into a second cloister to the east of it, no one can fail to be struck by the extreme picturesqueness and novelty of the view. In the foreground is the simple pointed arched and open arcade of the cloister; above this rise the gable of the south transept and the eastern apse with its surrounding aisle, and two lofty octagonal brick turrets, on each side of the apse, which look like minarets from Cairo, and, combined with the collections of domes on the roof, give a completely Eastern effect to the whole view. If, however, the detail of this striking building is examined, one can hardly be satisfied. There is throughout, as there so often is in Italy, a sad want of skill and neatness in the adjustment of details as compared to what is common in northern Gothic buildings. This indeed is a feature of all the works of the Pisani, and gives them the character — so common and so fatal in modern works — of being to a great extent the work of assistants and not of the master. Nothing can be much more clumsy than the provision for the steps leading to the turrets, nor weaker than the rectangular tracery inserted in the circular window of the transept. This, however, is a work of the middle of the fourteenth century, and Nicola Pisano, even if he were the first architect of the church, would not be responsible for it. I cannot say that I was at all satisfied either with the internal or external effect of the church, though it must be confessed that, when seen from a distance, there is excessive grandeur in the grouping of the multitude of domes, with the steep cone rising in the centre, and giving point and emphasis to the whole.[1] The arrangement of the windows and arches round the apse, for instance, is confused and weak to a degree; and I do not feel that Nicola Pisano has fairly settled the question of the adaptation of the dome to pointed buildings by his treatment of the domes here. The question is still, I think, an open one; and though it may be doubted whether, with our present opportunities, it will soon be satisfactorily answered, I still feel that it would not be difficult to answer it far more successfully than has been done here.

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[1] The order of the planets attached to the seven ages is as follows: I. The Moon. II. Mercury. III. Venus. IV. The Sun. V. Mars. VI. Jupiter. VII. Saturn.

[2] This is the tradition, but it is one which is not, I think, supported either by documentary evidence or by the style of the building. Nicola left Padua four years before the church was commenced; and Fra. Carello is mentioned in the archives of the convent as one of the architects, of whom, no doubt, there were several before the work was finished.

In the evening we heard some very fine music of ancient character in Sant' Antonio, after which there was a sermon, and, though it was a week day, there was a large congregation, very attentive and quiet.

The Duomo is a cold, unattractive church, — said, however, to have been designed by Michael Angelo, — and rather bold in the treatment of the pendentives under its dome. By its side stands a Lombard baptistery, the interior of which I did not succeed in getting a sight of; and I believe that I missed some valuable examples of fresco painting with which its walls and domed roof are covered.

We wandered about the melancholy streets of Padua, searching in vain for objects of any interest to our antiquarian eyes. It is true that the columns and arcades which support the houses are, many of them, ancient, but they are of a character very common throughout the North of Italy, and were not sufficiently novel or striking to draw off our attention from the melancholy and dilapidated look of the houses and shops which they half concealed and half supported. We saw also one or two old monuments at the corners of streets, — one of them called the "Tomb of Antenor," — similar in their idea to those which are so frequent in Verona.

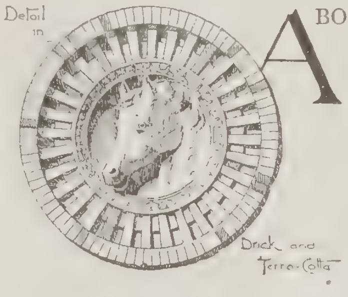
The next morning, therefore, saw us making our way to the railway station for Venice, sad only in leaving Padua that we could not spend more time there for the study, more quietly and carefully, of the lovely little Arena Chapel and the paintings of Giotto.

(*To be continued.*)

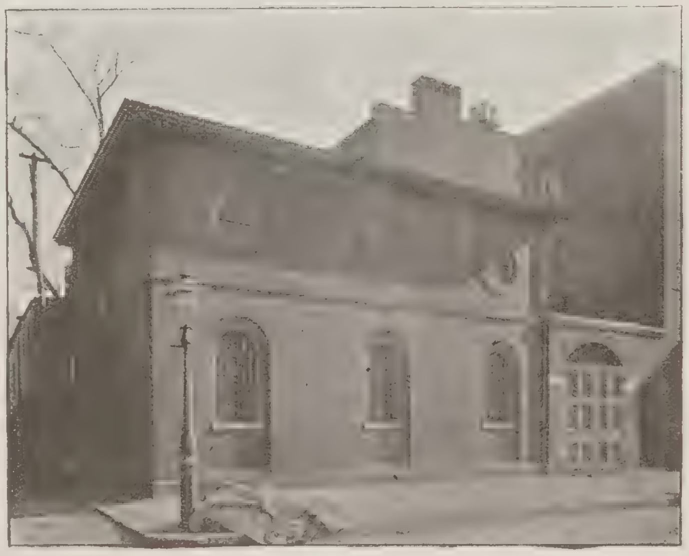
SOUTHERN COLONIAL BRICK.

MR. EDWARD WARREN DAY in *Putnam's Monthly Historical Magazine* for August, 1894, gives some most interesting data concerning the production of bricks in the neighborhood of Virginia during colonial times. It is a widespread belief that most if not all of the bricks for the earliest buildings erected in this vicinity were brought from England, but Mr. Day, in a search through the early records, which contain invoices of the cargoes of vessels coming to this country, finds no mention whatever of bricks. It has generally been supposed that bricks were brought as ballast, but ballast, according to Mr. Day, was seldom necessary with the heavy cargoes and small vessels common in the trade of this time. On the other hand, there are several entries on the colonial records concerning the arrival of brickmakers, who doubtless came to practise their trade, as is evidenced by the following bill, which was presented to the council of James City Country in 1708, for the construction of the parish church at Williamsburg: "150 loads of wood at 12*s.* per load, moulding and burning 70,000 bricks at 3*s.* 6*d.* per M. The remains of many old brickmaking plants scattered through this region, and the excellence of the clay found here, together with the testimony of the records, lead Mr. Day to the conclusion that the bricks for the earlier buildings were made in this country. The entire lack of documentary evidence to the contrary would seem to support this view.

RECENT BRICKWORK IN AMERICAN CITIES



ABOUT twenty-five years ago the term "the best Baltimore brick" meant the best of its kind to be found in this part of the world, or indeed — in the assurance of pardonable local pride, and, possibly, some ignorance — anywhere else. Perhaps this is equally true to-day, but, while in popular opinion it then stood almost alone in its superiority, it now has many rivals of various kinds and degrees of merit, and, moreover, the very qualities themselves that at one time are regarded as desirable, or even essential, at another, for many purposes and various reasons, are no longer preferred. At that period a façade of "forty-dollar pressed brick," with finest cut white mortar joints, was regarded as the best possible piece of brickwork that could be put together, not only from the bricklayer's point of view, but also from that of the educated public, and undoubtedly it was exceedingly red and white and smooth and "neat" and monotonous. A large majority of the fronts of the most important and expensive houses were erected in this style, and when this was combined with the whitest and smoothest Maryland white marble, as a "trimming," the acme of perfection in architectural design for a street façade was supposed to have been attained. The Philadelphia specialty of solid white wooden shutters never obtained, — scarcely a single instance of it appeared, for which a past and present community are duly grateful.



J. L. WHITE'S STABLE, BALTIMORE.

A few entire fronts of brownstone or white marble were erected during the same period, but they were a small minority, the brownstone, being chiefly Connecticut, soon showed its conspicuous qualities

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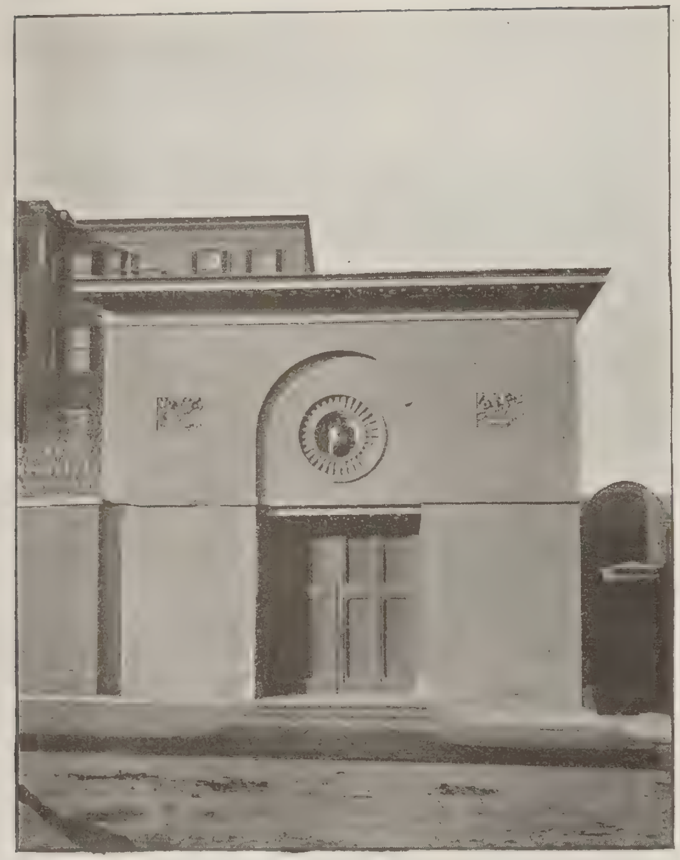
[1] The eastern chapel and dome are comparatively modern, and the coverings of the other domes appear to be also modern; but I suppose they follow the old outline.

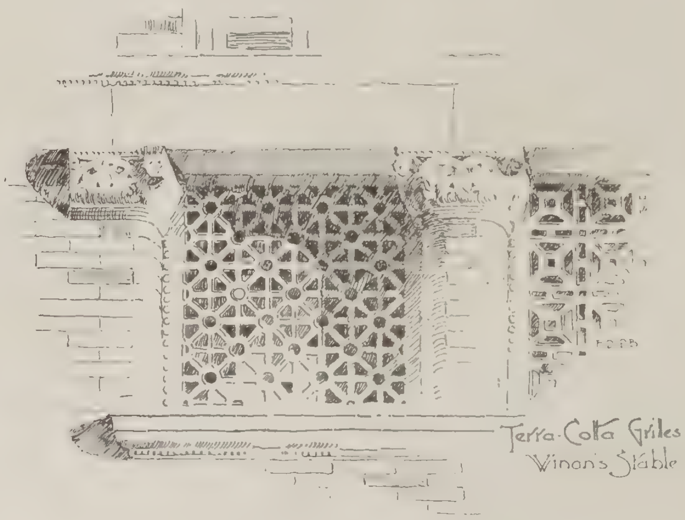


A. S. ABEL'S STABLE, BALTIMORE.

of rapid crumbling and decay, and justly fell into disfavor. These brick and white fronts at first showed the influence, in detail, of the better forms that had preceded them, and which had come down from the good things of the "Colonial Period." But little by little, as carpenters and builders assumed the *rôle* of architects,— apparently in proportion as they grew to know less of architectural forms, — these fairly good designs fell from bad to worse and finally to abominations in the cheaper work, covering miles of desolation: the marble was abandoned for painted white wood, and forms and proportions of detail, impossible in any natural use of either wood or marble, took the place of appropriate and legitimate ornament. One inherent weak point belonged to even the best of these expensive brick fronts. On account of the cost, they were all laid as "stretchers" forming a four-and-a-half-inch screen in front of a common brick wall, laid up entirely independent of it, and to which it was only bonded here and there by a cut brick. But this was only one of their many bad qualities both of construction and design, which generally asserted themselves sufficiently to bring disfavor upon the style, and to-day we see little of it, except in its cheapest and most degraded form, not to be classed as a style in any sense.

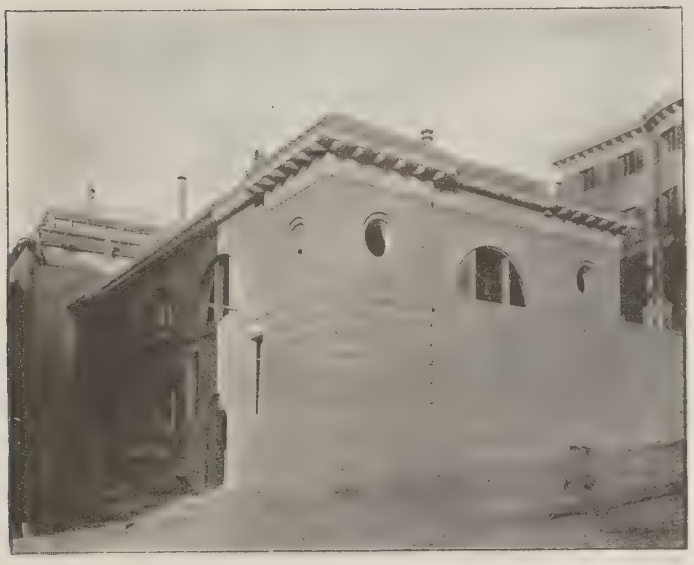
These good things of a quarter of a century or more ago were, as we have said, the children of a very good period preceding them, direct Colonial descendants, solid, spacious, comfortable, old brick buildings, many now over a hundred years old, built in "Flemish bond," often of imported English brick, with bits of classic doorways and windows and cornices, sometimes of marble, sometimes of wood, highly respectable and dignified old specimens that here and there still appear in the older streets, suggesting pictures of prosperous, aristocratic social life of past generations, now generally put to sadly debased uses, but still looking down with a certain dignity on their vulgar surroundings, giving the impression to the passer-by that their degradation has all come from without, and that within themselves there was still left sufficient virtue and vitality to enable them, with the judicious help of a restoring hand, once more to assert their merits and become comfortable and attractive dwellings, suited to the social life of to-day.

In Baltimore, the architecture of those days, and up to the beginning of the decadence of thirty years ago, was, in kind, as good as the best of the same kind elsewhere in America. New York, Boston, and Philadelphia were the only other cities ranking with it; what was regarded as good in one was also good in the others, both as to design and construction; the architect as he is known to-day was about as rare in one place as another, the good things were all derived from very much the same sources; just where they came from we will not stop to discuss.



The good Colonial specimens are now familiar to every one from numerous publications. A series of examples, their legitimate descendants in the later period in Baltimore, are not so well known, but strike the artistic eye of the stranger whenever he runs across them as something of a specialty of the city. We refer to numerous small brick stables to be seen here and there through the streets, often attached to dwellings of the best and most expensive class, and which are quite conspicuous examples of good proportions and

UNITARIAN CHURCH, BALTIMORE.



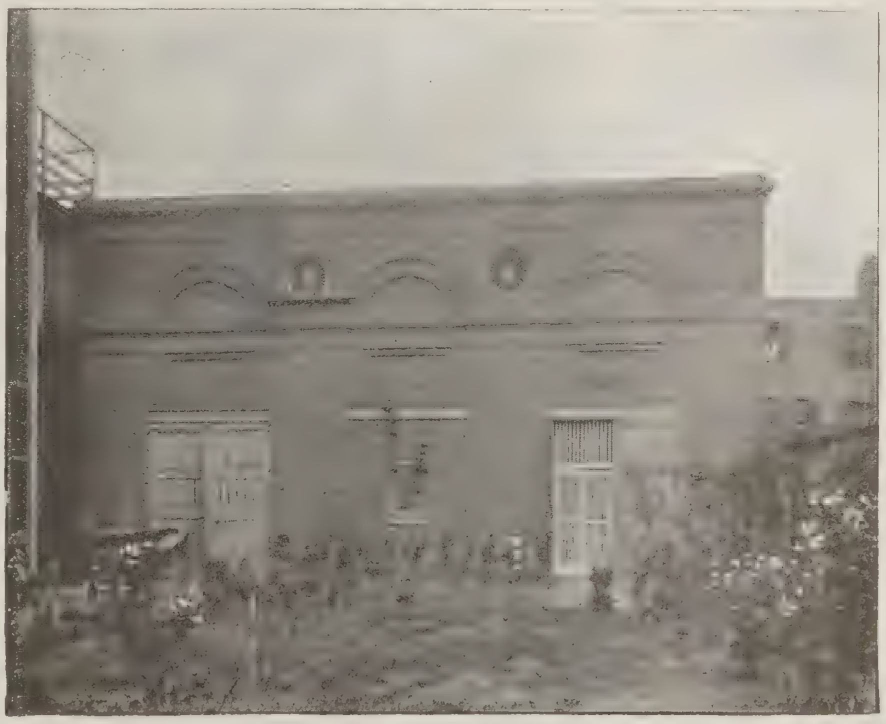
THE THOMAS STABLE, BATIMORE.

effective results with character obtained with a perfectly natural and simple use of bricks. Of these we give a few illustrations of the best.

The Winans stable does not, however, belong to this period, being a bit of recent work, done only a few years ago. The terra-cotta "grilles," which are shown belonging to it, and which were made from the architect's designs by a firm in this city, is the only instance we know of such detail in terra-cotta. The effect is excellent.

The bit of terra-cotta from the pediment of the Unitarian church is the only instance we know of any terra-cotta ornament being used in the older work in Baltimore.

Between this period and the really good things of the last ten years that have reappeared in brick and terra-cotta was a veritable "dark age," an epoch of the most totally meaningless and frivolous use of brick in the attempt to obtain vulgar ornamentation where it was not needed, a style of work begun cautiously, with some intelligence, by a few architects, examples of which may be distinguished amid the mass,— bits of brick carving or terra-cotta panels, of no special artistic merit, but within legitimate lines; but this field once entered was seized upon with such avidity by the speculative builder that the architect, in terror at what his timid attempts had brought upon the city, retired in disgust, while "fools rushed in" where he dared no longer tread. We know of no city, save Washington, perhaps, that can rival Baltimore in the quantity and quality of this brickwork abomination, and, alas! the work still goes on in rows of cheap and worthless houses.



THE OLD JOHNS HOPKINS STABLE, BALTIMORE.

IN the inter-club competition under the auspices of the Society of Beaux Arts Architects, the club awards were given to New York, Boston, and Philadelphia in the order named.

CLEVELAND ARCHITECTURAL CLUB.

THE CLEVELAND ARCHITECTURAL CLUB, with a charter membership of fifteen, was organized Thursday evening, November 22, for the study of architecture and the allied arts, and persons interested in this study are eligible to membership in the club.

Upon the first and third Thursday evenings of each month regular meetings will be held, the last evening of the month being for competitions. The subject for the December competition is a "Stone Entrance to a Residence."

The club is officered as follows: President, John W. Russell; Vice-President, Harry S. Nelson; Secretary, Herbert B. Briggs; Librarian, B. S. Hubbell; Treasurer, E. E. Noble. Members of executive board, W. D. Benes and Wilbur M. Hall. The officers, with the following, constitute the charter membership: Robert Allen, Frederick Baird, G. B. Bohm, P. G. Griffin, Williard Hirsh, Ray Rice, C. S. Schneider, and Albert E. Skeel.

All communications should be addressed to the Secretary, at 40 Blackstone Building, Cleveland, Ohio.

HERBERT B. BRIGGS, *Secretary.*

CHICAGO ARCHITECTURAL SKETCH CLUB.

REPORT ON THE ROBERT CLARK COMPETITION.

THE jury appointed to award the medals for the Robert Clark Competition submit the following:—

The competition as a whole was a decided success. The draughtmanship excellent, with but few exceptions. Considering the age limit of thirty years, the same cannot be said of the main feature in a competition, that is, that a building shall look like and suggest what it is intended for. The great majority of contestants submitted designs too suggestive of art galleries, institutes, etc., too monumental in their arrangement of parts, and the disposition of detail too lavish.

Sixty-five designs were submitted, aggregating one hundred and thirty drawings of an unusually high order of merit.

The selections were finally narrowed down to four designs, and awards were made by written vote of each judge.

For Gold Medal, WILLARD HIRSH, Cleveland, O.

For Silver Medal, EDWIN R. CLARK, Lowell, Mass.

For Bronze Medal, ERNEST F. GUILBERT, Chicago, Ill.

Mention, ALBERT KAHN, Detroit, Mich.

The drawings will be exhibited next month at the Art Institute, and immediately thereafter be returned to their owners.

JOHN ROBERT DILLON, *Secretary.*

I DO not feel able to speak with any confidence respecting the touching of sculpture with color. I would only note one point, that sculpture is the representation of an idea, while architecture is itself a real thing. The idea may, as I think, be left colorless, and colored by the beholder's mind; but a reality ought to have reality in all its attributes; its color should be as fixed as its form. — *John Ruskin.*

THE ART OF BUILDING
AMONG THE ROMANS.

Translated from the French of Auguste Choisy by

ARTHUR J. DILLON.

CHAPTER II. — CONTINUED.

II. VAULTS WITH ARMATURES OF BRICKS LAID FLAT.

ARCHES of brick, such as those in the Basilica of Constantine, had the advantage over the continuous system of Plate I. of requiring much less material, while filling their *rôle* of supports quite as satisfactorily. Nevertheless, at an equal cost, a continuous armature would have been more convenient; so it would seem only natural to seek some arrangement of the materials which would combine with the merits of the preceding system that of continuity in the supporting surfaces, and it is probable that the second system of supports found in the Roman vaults had its origin in this desire.

The armature, under this system, was made by laying large bricks, ordinarily two Roman feet (sixty centimeters) square by four to five centimeters thick, over the entire convex surface of the centring, in good plaster or quick-setting mortar, so as to make a thin and unbroken envelope which followed the form of the intrados of the vault and resembled a sort of curved paving. (Fig. 27.)

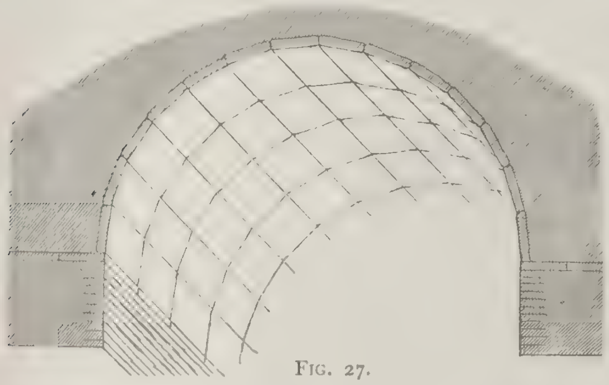


FIG. 27.

This sometimes constituted the entire armature, but, ordinarily, there was laid on it a second layer of bricks, of smaller dimensions, forming a second envelope exactly like the first, and bound to it by the interposition of a bed of plaster or mortar. These layers together formed a protective crust, a thin vault, covering the entire centring (Fig. 28), which, though not able to hold its own weight if the centring was removed the moment it was completed, would become firmer as the rubble was laid, and would eventually be able to support alone the entire upper part of the vault. In fact, the obstacle to the immediate removal of the centring lay not so much in the thinness of this crust as in its semicircular form; for a vault of bricks laid flat-wise is stable only under the conditions of being a very flat arc, and of being rigidly held by its abutments; but being semicircular, it will acquire the necessary stability if a backing is placed on the flanks A B and D E (Fig. 28) to prevent its deformation; and this evidently was the case in the Roman armatures of flat-laid bricks: the rubble did not commence to bear on the centring until its first courses had reached a level such as B D (Fig. 28), at which time the part of the armature which carried the load, the really supporting part of the tiling, was reduced to the small arc B C D, and was under the best conditions of stability. It would, indeed, have been possible to remove the centring when the rubble had reached the level B D, to set it up as it was needed at other points, thus building the vault in sections, and using the same centring again and again for succeeding parts. This was, in fact, a process often followed by the Romans; to be convinced of it, it is only necessary to examine the armatures. It will be seen that the joints, instead of being broken, are continuous, and that the bricks are laid side by side, like the squares of a checker-board (Fig. 27), agreeing with the supposition that the construction was by sections; for, if the bricks had been laid with broken joints, each section would have terminated in toothings, and there would have been some difficulty in joining the adjacent sections to it; hence, the ancients, suppressing all bonding between the sections, avoided the trouble that would otherwise have arisen in joining them together.

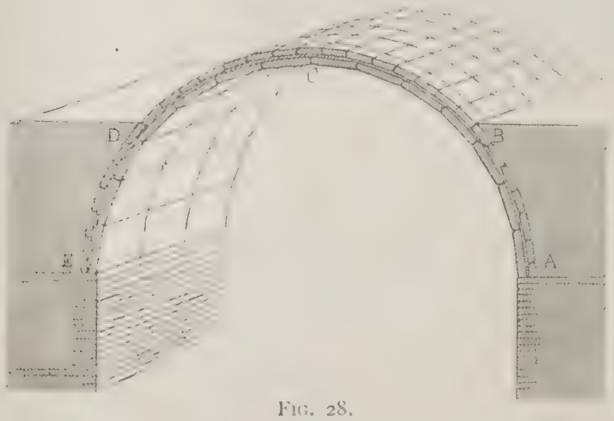


FIG. 28.

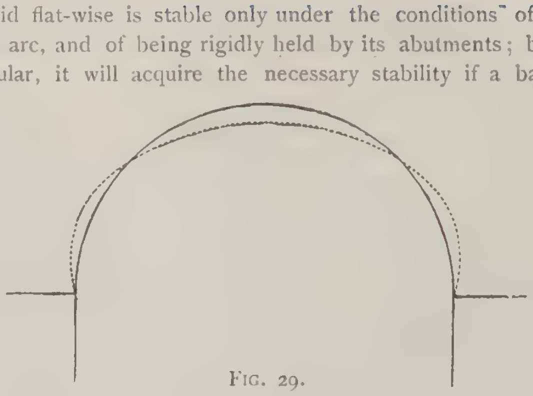


FIG. 29.

The economy in centrings is evident; it was sufficient, as was remarked in an analogous case, to make the centring strong enough to support the first of the layers; this, in turn, served as the centring for the second, and, with it, formed a support strong enough to carry the entire weight of the rubble.

The incomplete vault shown in the following drawing (Fig. 30) will serve to emphasize the general scheme of the system of supports built of flat-laid bricks; it is taken from the Baths of Caracalla, perhaps the greatest edifice in which the system we are studying was used. Here there is a first layer of bricks two ancient feet (sixty centimeters) square, and about four or five centimeters thick, a second layer of smaller brick, measuring about two thirds of an ancient foot, approximately twenty centimeters, and, in addition, a number of isolated bricks placed on edge, like headers, in the second layer, forming projections on the extrados of the armature.

The uses of the different parts of this singular construction have already been explained, and the progress of the work itself is not difficult to follow. On the trusses of the centring there was nailed, not a continuous lattice, but narrow planks (Fig. 30) spaced about two feet from centre to centre, and on these the larger bricks were laid as quickly as possible; the wooden covering of the centres was thus extremely cheap; and, moreover, the first bed of bricks could be laid with great rapidity because of the large surface covered by each brick. The first bed being completed, the second could be laid in less haste, and could, therefore, be of bricks of smaller size; and almost invariably, those of the second layer are less than those of the first. I know of but one example, the Pantheon of Agrippa, where both layers are of the larger square brick (Plate XIII.), and as the second was intended, as we will see, only to protect the joints of the first, bricks about twenty centimeters square would seem quite sufficient.

Yet it was not enough to give only a firm support to the rubble of the vaults; it was well to insure a certain amount of adherence between the armature and the rubble, so that when the centring was removed the whole would be as one single, bonded, and continuous mass; with this object in view, bricks were placed here and there, projecting from the second layer, and, as they had a tendency from their own weight to fall flat on the centres, other bricks were placed behind them as supports, as in parts of Villa Hadrian. (Fig. 31.)

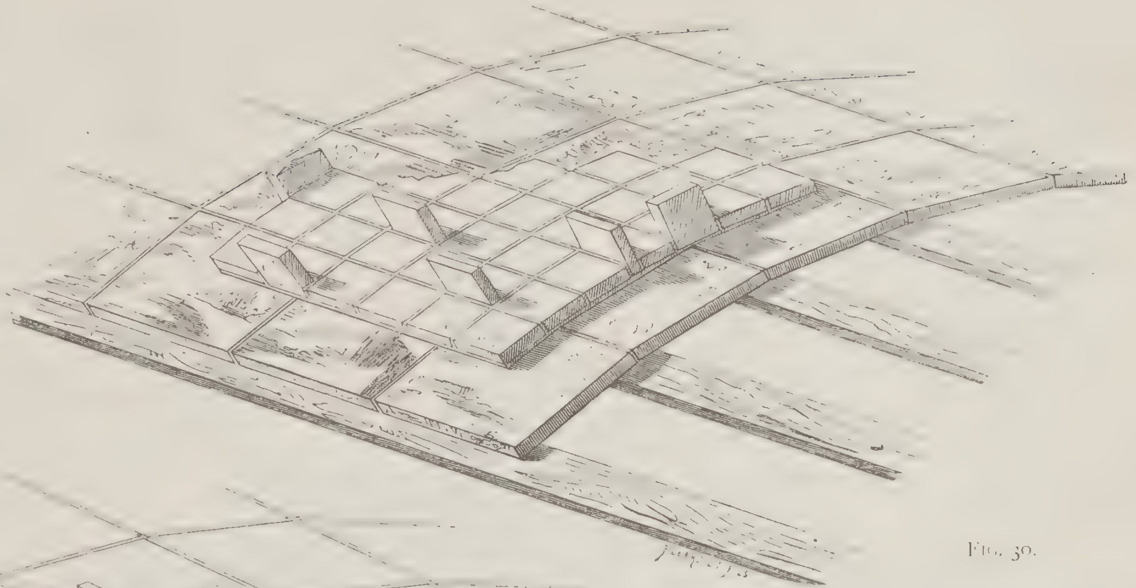


FIG. 30.

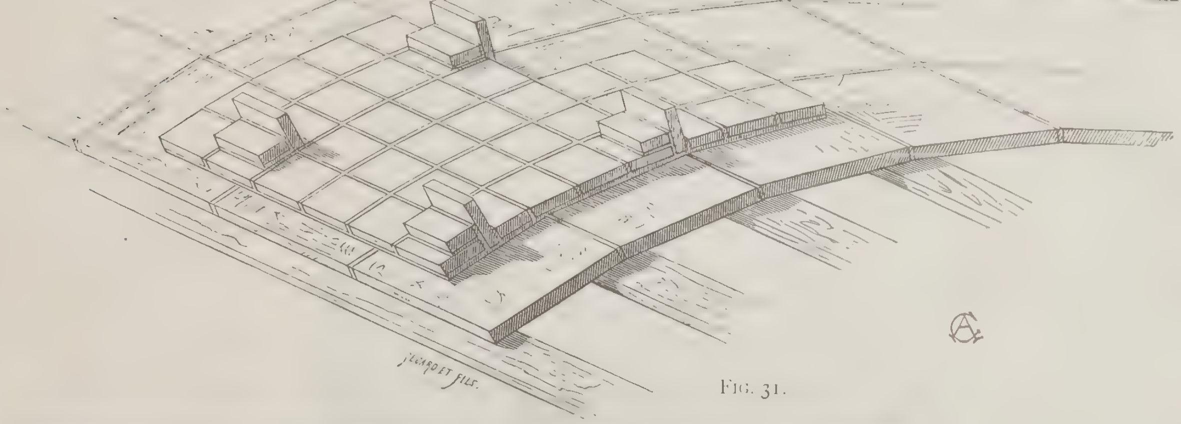


FIG. 31.

Such were the vaults at the time of their construction; but one must not expect to find this disposition undisturbed in their ruins. The greater part of the linings of bricks have disappeared, and usually their remains are to be found only near the springing of the vaults, in the re-quatrant angles formed by their meeting with walls, and at the other points where the fragile squares were best protected from destruction. Near the summit of the vaults the double linings of brick are fallen, and the original arrangement of their parts can only be judged from the more or less distinct imprints which they have left in the rough masonry; the only parts which have everywhere been preserved are the headers, whose ends can be seen in slight protection on the face of the rubble. (Plate IV., Fig. 2.) Sometimes both the headers and the bricks which propped them are still in place, swallowed up in the rubble, but of the rest of the armatures there remain only the fragments.

BRICK FOR A BANK RAILING.

A BANK on Main Street, Buffalo, shows how effectively brick may be used for interior work in place of cabinet-work. The wall is finished to a height of several feet with a light shade of Roman shape Pompeiian brick, and the bank enclosure up to the counter level is built the same way. A finish of quartered-oak with some Bower-Barffed iron work completes the job. In point of color and attractiveness it is one of the most successful things we have seen.

THE CASTLE SQUARE THEATRE.

ON Plate 92 we reproduce Messrs. Winslow & Wetherell's detail drawing of the entrance to the new Castle Square Theatre, in Boston. This is of white terra-cotra made to match the white brick of the Castle Square Hotel which occupies the front part of the lot on which the theatre is built. The terra-cotta work was done by the New York Architectural Terra-Cotta Co.

THE MANHATTAN LIFE BUILDING, NEW YORK.

THE following data will be of interest and an eye-opener to those of our readers not familiar with large building operations.

Height above Broadway, 347 feet.

Height above base foundations, 400 feet.

Height above tide water, 380 feet.

Time spent building foundation, four and two thirds months.

Time spent in erecting building after completion of foundation, eight months.

Time from commencement of actual construction above foundation until the roof was reached, three months.

The foundation is now for the first time used as an office building, but it has been previously used in supporting many heavy bridges.

Weight of building when empty, excluding foundations, 60,000,000 pounds.

Weight of building when all the floors are fully loaded, 65,000,000 pounds.

Contains 775,000 rivets and bolts.

The superstructure contains 3,500,000 bricks.

Thirty-three private houses could have been constructed with the bricks used in this building.

These bricks would make a single column more than 600 miles high if they stood one upon another.

11.000 barrels of cement were used.

The building contains about thirty-five miles of electric wires, ranging from one sixty-fourth of an inch in diameter to one and one half inches, more than five and one half miles of gas, water, waste, and vent pipes, and about five miles of steam pipes.

HOTEL RENAISSANCE, NEW YORK CITY.
CLARENCE LUCE, ARCHITECT.
FIREPROOFED BY THE RARITAN HOLLOW AND POROUS BRICK COMPANY.

EDITOR OF THE BRICKBUILDER.

Sir, — We have noticed your report of the tests made for the Eastern Hydraulic Press Brick Company, by the Watertown, Mass., United States Arsenal. We had tests made at same place, as follows:

Test No.	Description.	Height.	Compressed Surface.	Sectional Area. Sq. in.	First Crack.	Ultimate Strength.	
						Total lbs.	Lbs. per Sq. in.
7098.	No. 4, Dark buff,	2.42	4.04 8.56	34.58	564,000	800,000	23,135
9099.	" 4, " "	2.43	4.05 8.54	34.59	265,000	626,000	18,098
7100.	" 5, " "	2.44	4.12 8.57	35.31	247,000	346,800	9,822
7101.	" 5, " "	2.42	4.11 8.54	35.10	234,000	423,900	12,077
7102.	" 10, Light buff,	2.35	3.98 8.32	33.11	158,000	607,200	18,339
7103.	" 10, " "	2.32	3.95 8.24	32.55	372,000	612,200	18,808

The above is attested to by J. W. Reiley, Major Ordnance Department United States Army, and by J. E. Howard. We send you the above tests, to show you the quality of our goods. We hereby issue a challenge on test No 7,098 and claim the belt on it.

You will note the capacity of the United States testing machine is eight hundred thousand. Our test No. 7,098 has withstood the machine to its capacity.

T. W. CARMICHAEL, *Mgr. Brooke Terra-Cotta Co.*

TOWER OF S. CECILIA IN ESTERNO, ROME.

THIS tower is the subject of the present month's Hydraulic-Pressed Brick advertisement on page vii. Mr. C. Howard Walker, in his articles on Italian brick towers, will write critically concerning this tower as well as others the Hydraulic-Press Brick Companies will publish in the course of their advertisement.

MESSRS. FORBUSH & HATHAWAY have designed a number of very successful school buildings in brick which we hope to publish in the same satisfactory manner as the one at Greenfield, in this number. It is a pleasure to receive drawings so carefully prepared and so well suited for reproduction. Messrs. Forbush & Hathaway are making a specialty of school work, and have quickly made a reputation in this line.

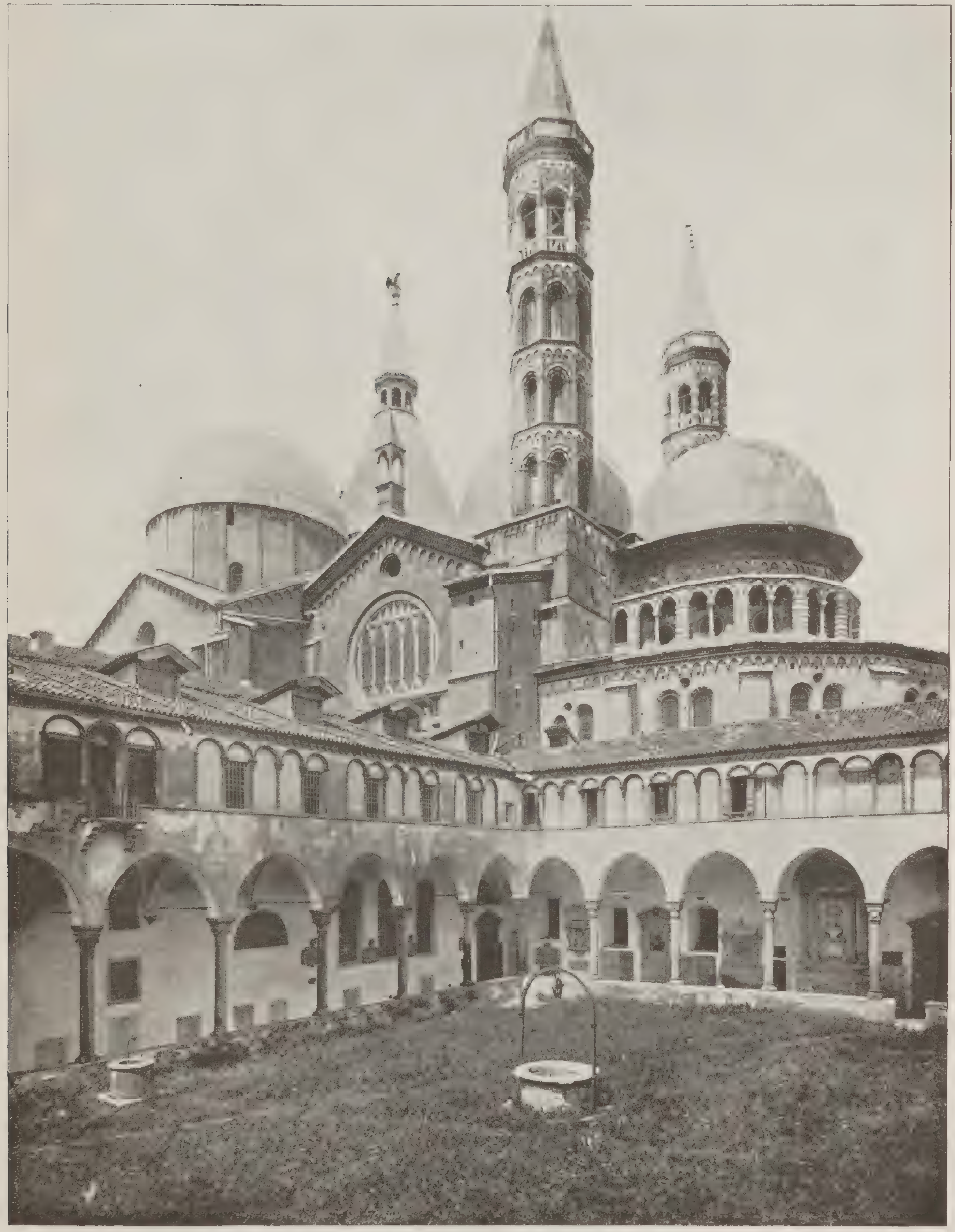
IN our publication last month of Watertown tests on the Eastern Hydraulic-Press Brick, we omitted, on page 228, to state that in tests 7056, 7060, and 7064 the tests were made on edge. This accounts for the apparent variation in strength, as they could not in this position stand so much pressure as the bricks tested flat. The test as published indicated a variation in strength which is not the case.

DR. FÜHRER, a European archæologist, has announced the discovery of a two-story temple in India built of carved or moulded brick, and dating from the first century B. C.

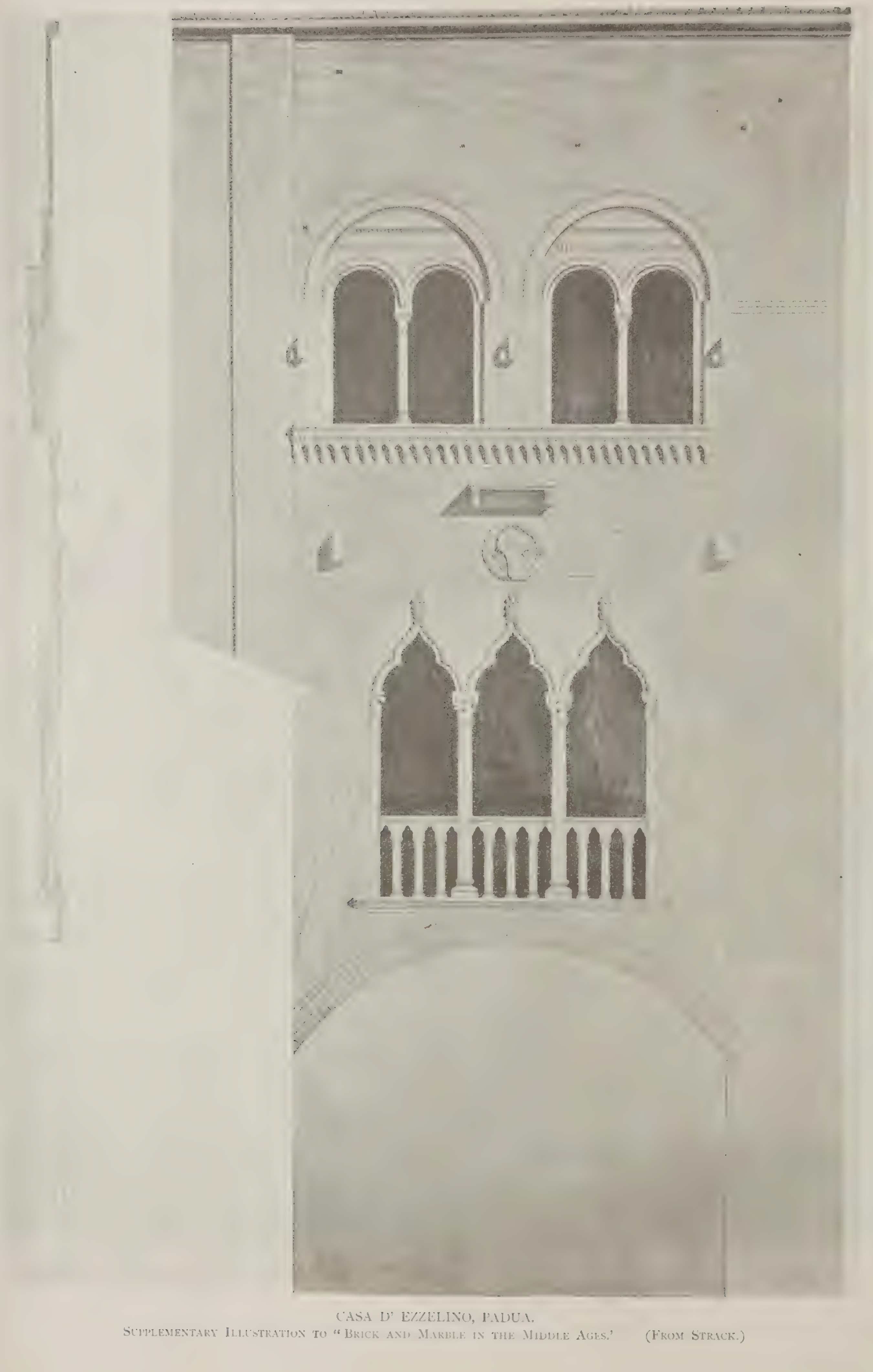
WITH the October number the *Engineering Magazine* inaugurated its "Review of the Industrial Press," to take the place of its "Technical Index." It aims to do for industrial literature what the *Review of Reviews* does for general literature. All we can say is that such a move is of the utmost importance to all technical readers, and the magazine is worth its subscription price for this one thing alone.

MR. H. A. BREDE and Mr. George C. Zimmerman have formed a copartnership for the practice of architecture, with offices in the Kanter Building, Detroit. The old firm of Brede & Mueller has been dissolved by mutual consent. Messrs. Brede & Zimmerman desire to be supplied with samples and catalogues, by manufactures and dealers.

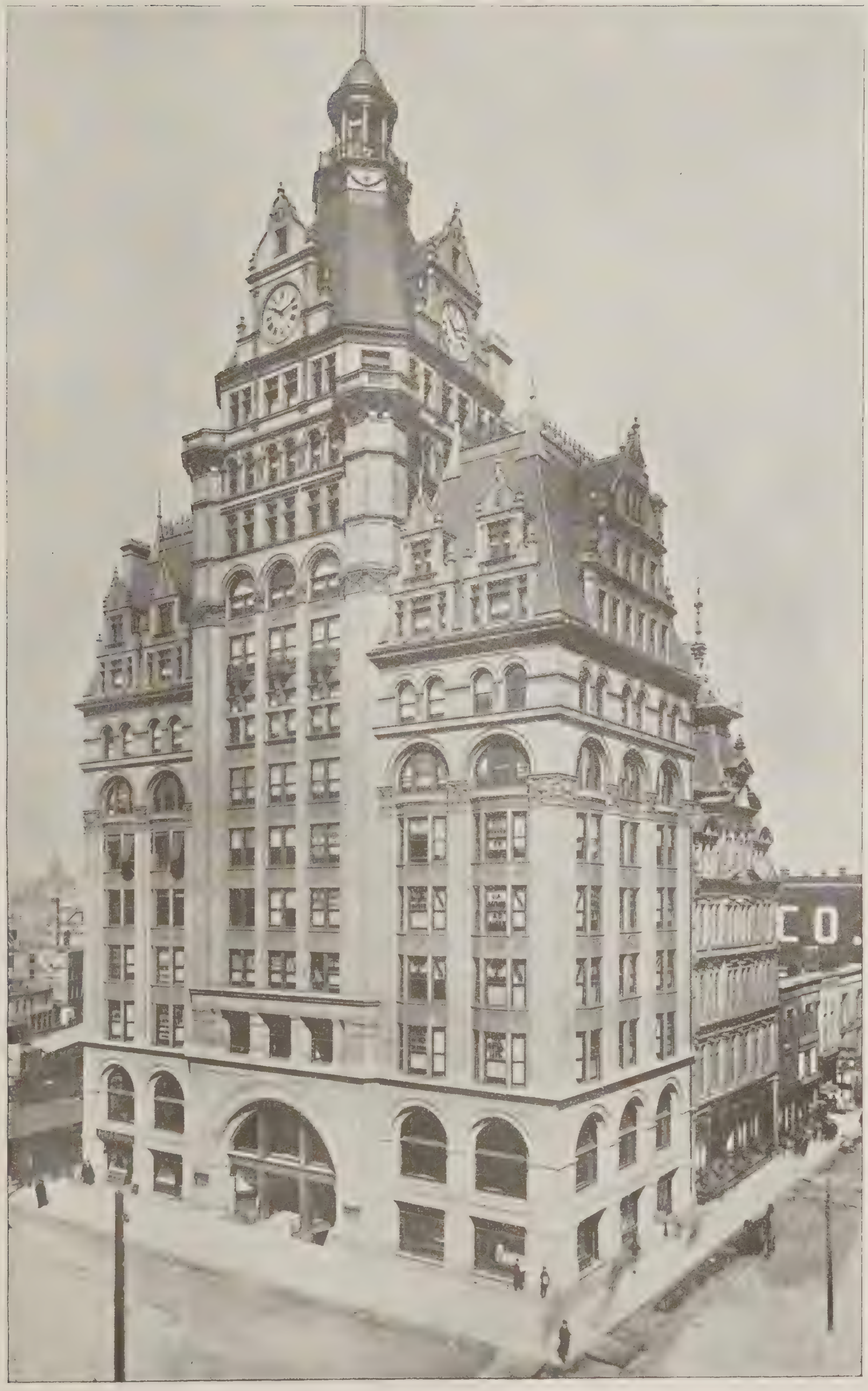
MESSRS. THEODORE C. LINK, Alfred F. Rosenheim, and William B. Ittner, of St. Louis, all architects of well-established individual practice, have associated themselves under the firm name of Link, Rosenheim & Ittner, for the practice of architecture. They have opened offices on the ninth floor of the Union Trust Building.



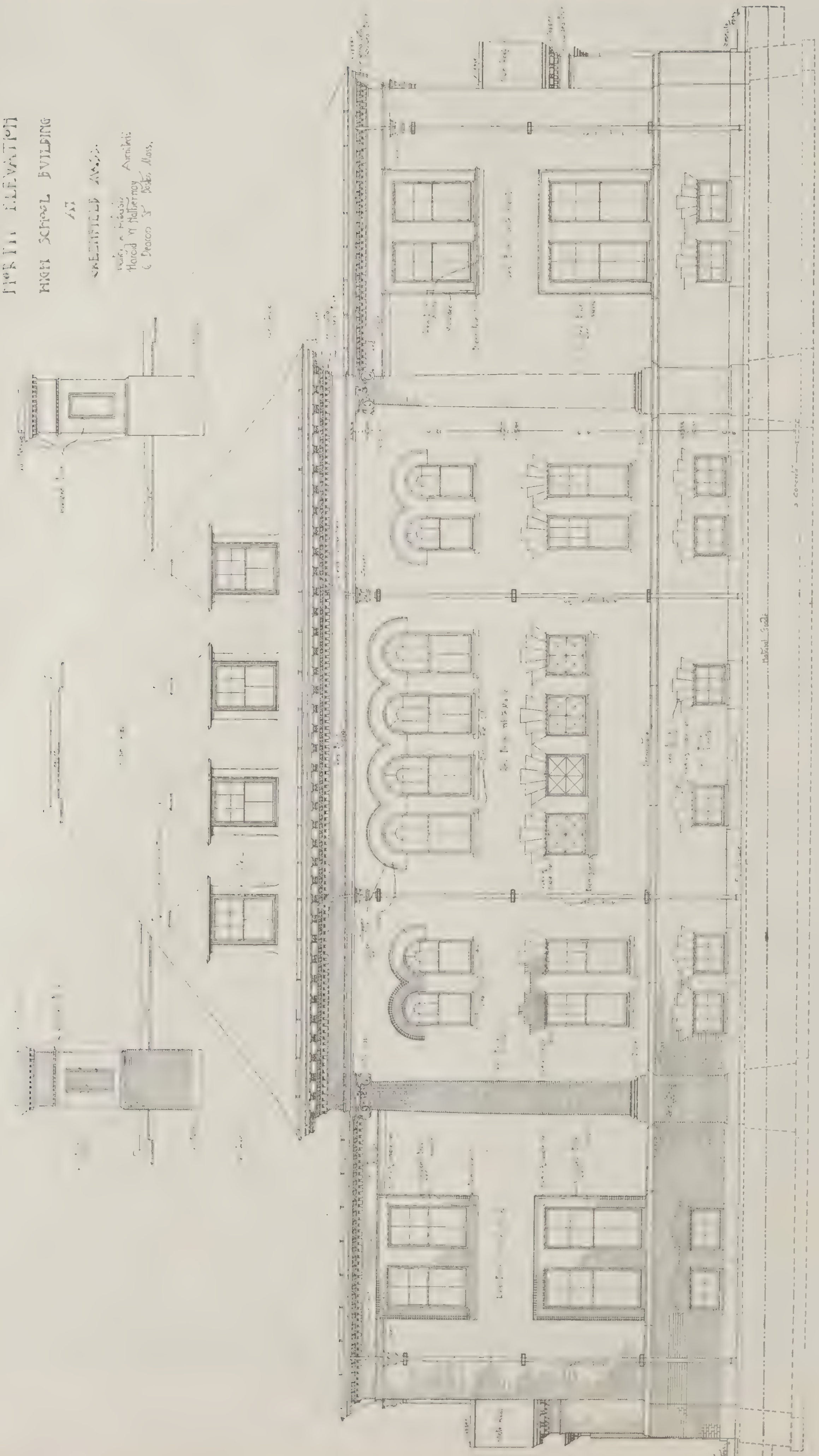
CHURCH OF SAN ANTONIO AT PADUA. For Another View See Page 243.
Supplementary Illustration to "Brick and Marble in the Middle Ages."



CASA D' EZZELINO, PADUA.
Supplementary Illustration to "Brick and Marble in the Middle Ages.' (From Strack.)



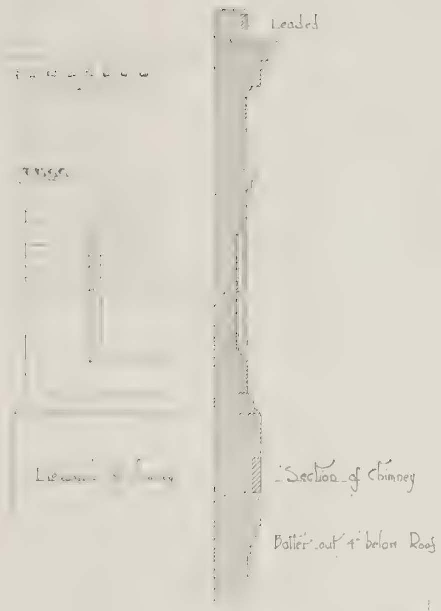
THE PABST BUILDING, MILWAUKEE, WIS. S. S. BEMAN, ARCHITECT, CHICAGO.
FOR DETAILS OF STEEL CONSTRUCTION SEE FIREPROOFING DEPARTMENT.

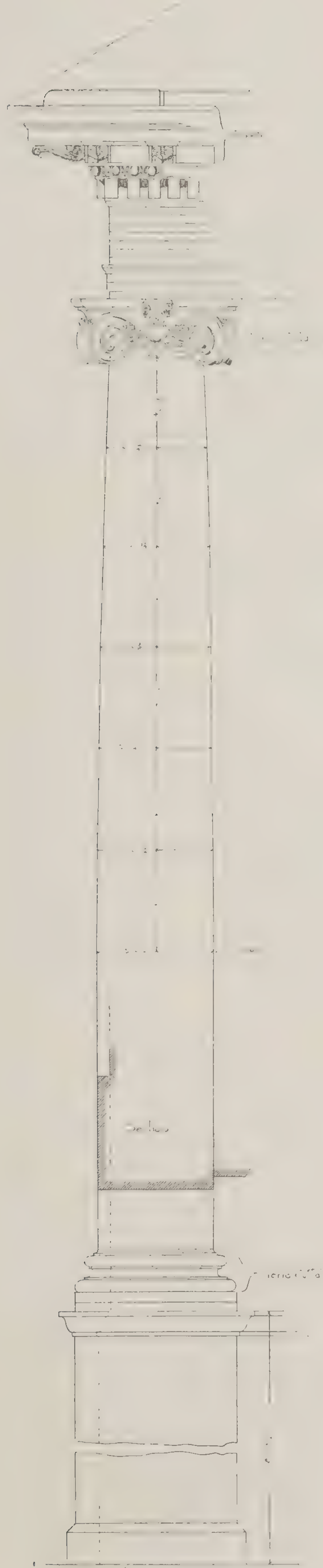

NORTH ELEVATION
HIGH SCHOOL BUILDING
AT
GREENFIELD MASS.
Harold M. Hatterney Architect
6 Beacon St. Boston, Mass.

EXTERIOR DETAILS.

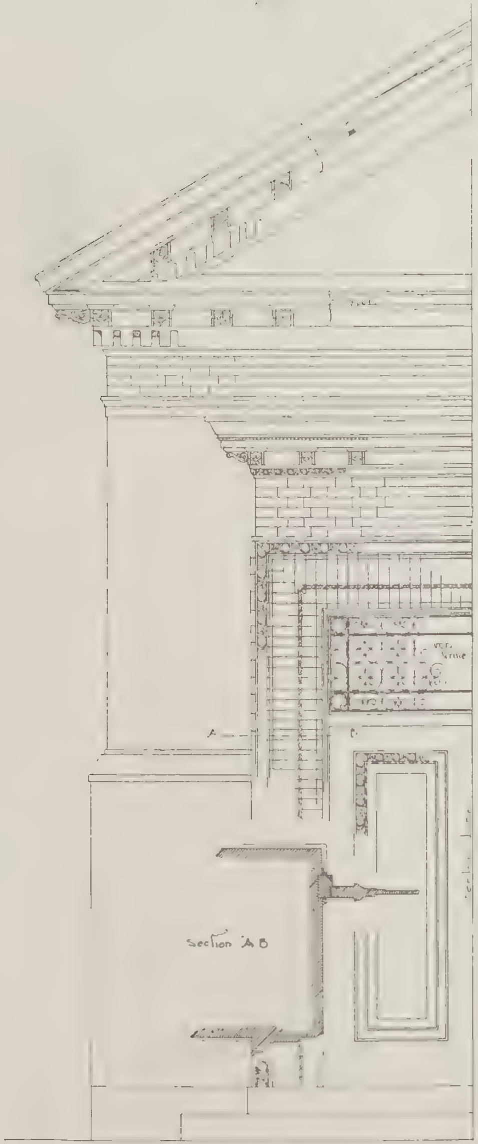
HIGH SCHOOL BUILDING
AT
GREENFIELD, MASS.

Walter R. Forbush
Harold H. Hatheway Architects
6 Beacon St. Boston, Mass.

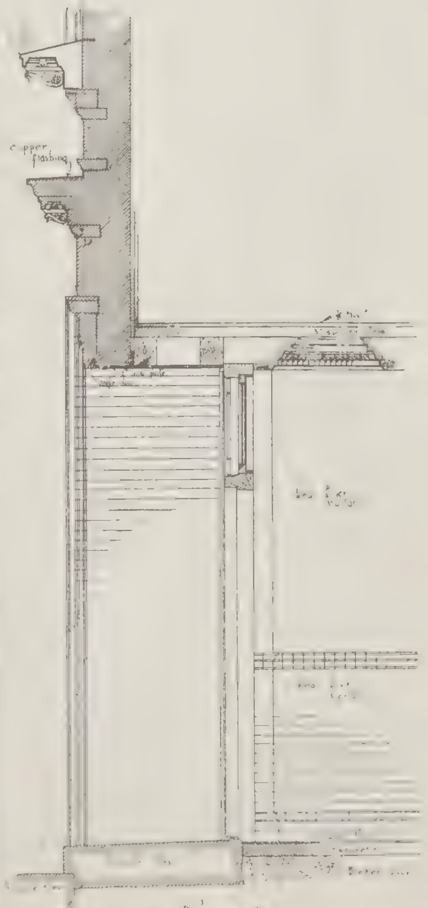




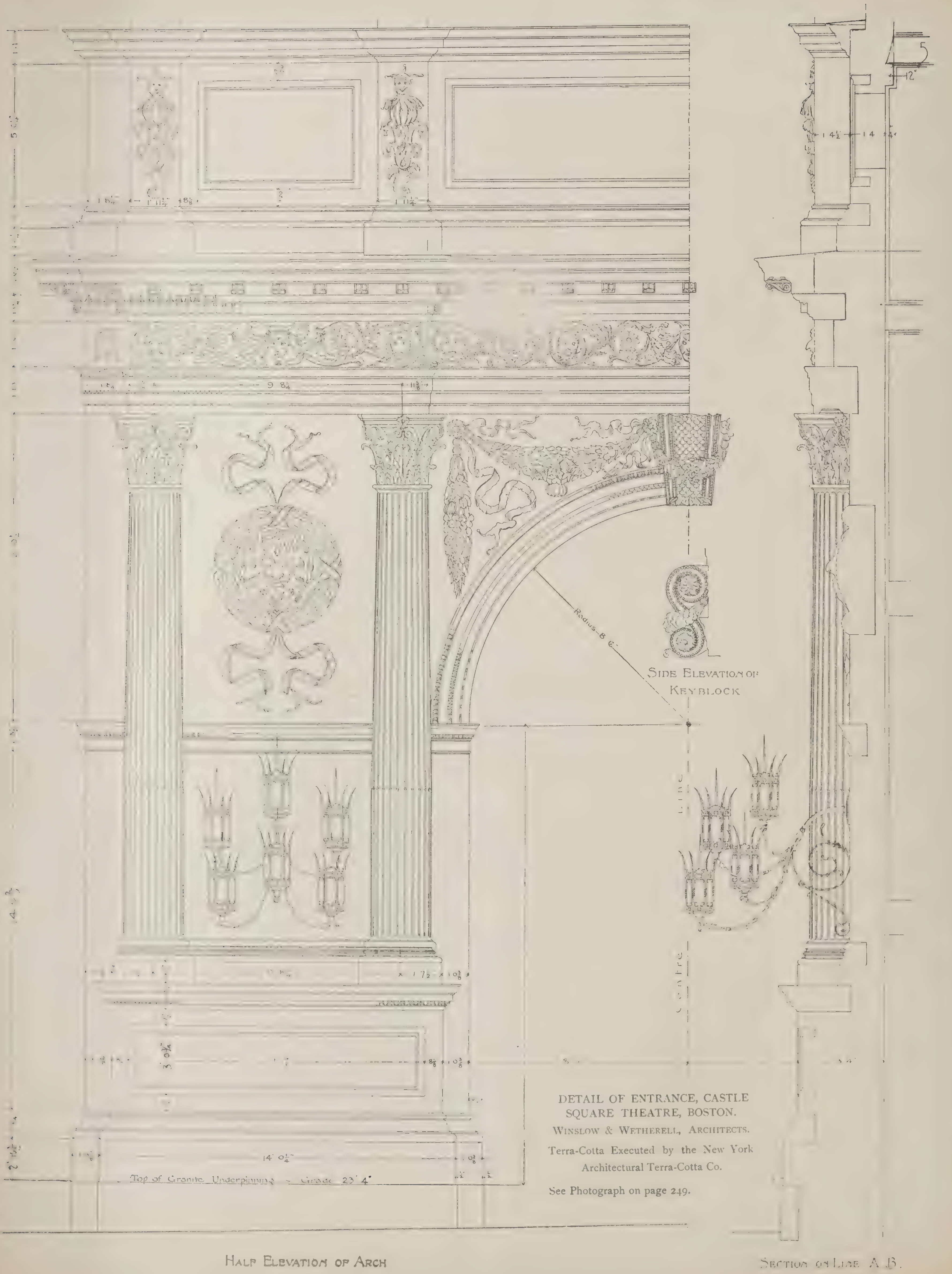
Elevation of Pilaster on Corner.



½ Elevation of Entrance Porch



Section of Porch



DETAIL OF ENTRANCE, CASTLE SQUARE THEATRE, BOSTON.

Winslow & Wetherell, Architects.

Terra-Cotta Executed by the New York Architectural Terra-Cotta Co.

See Photograph on page 249.

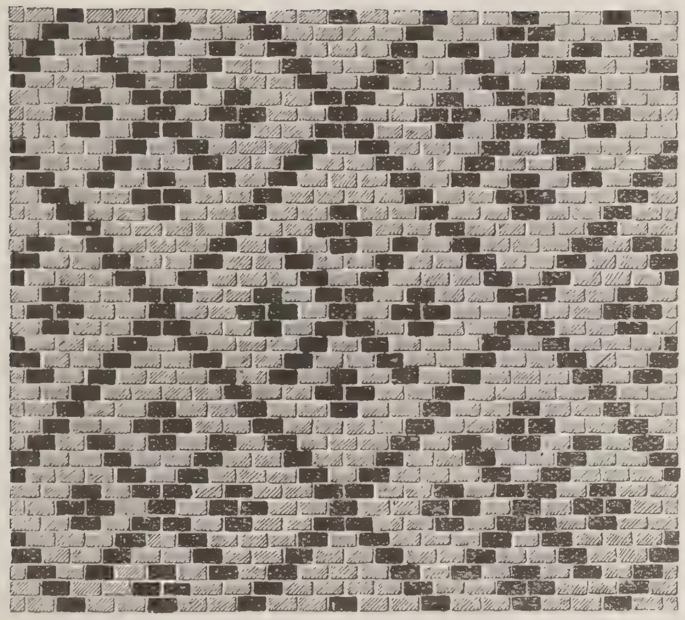


Fig. 24

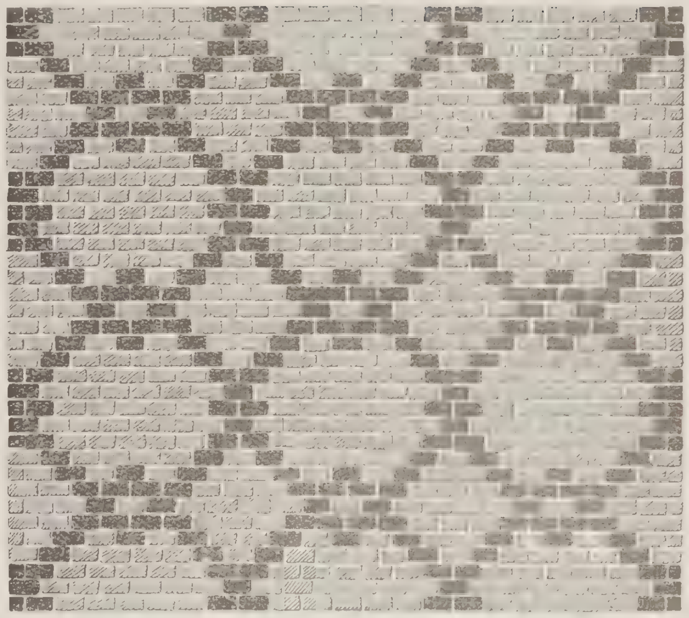


Fig. 25.

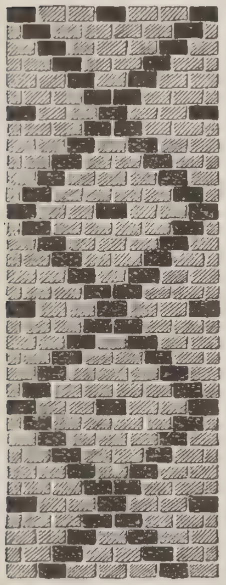


Fig. 26

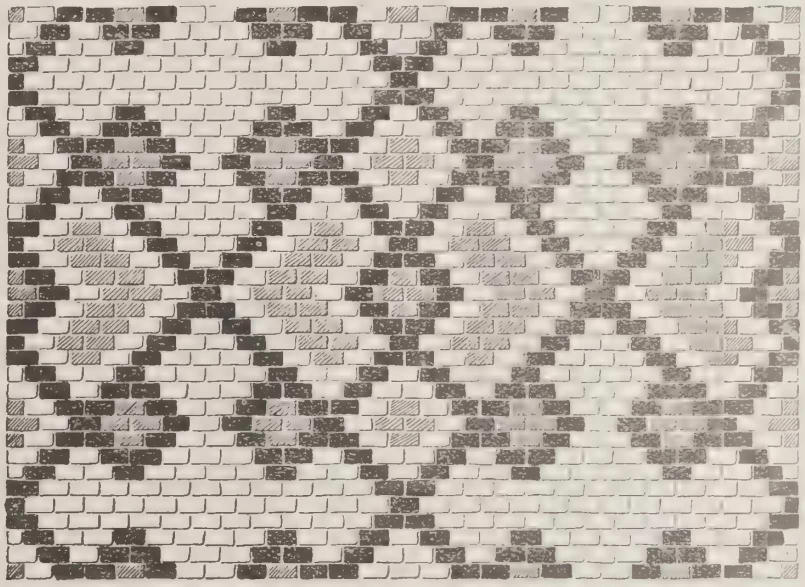


Fig. 27

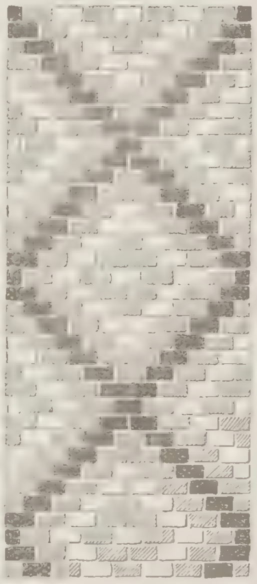


Fig. 28

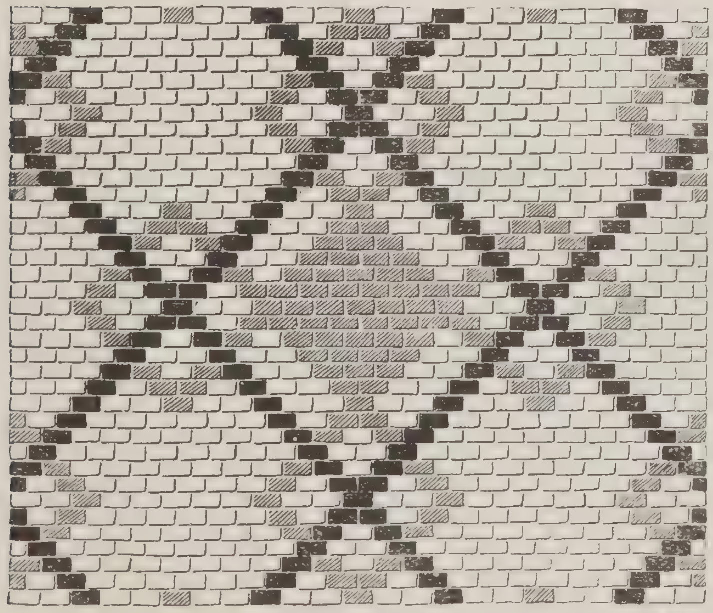


Fig. 29

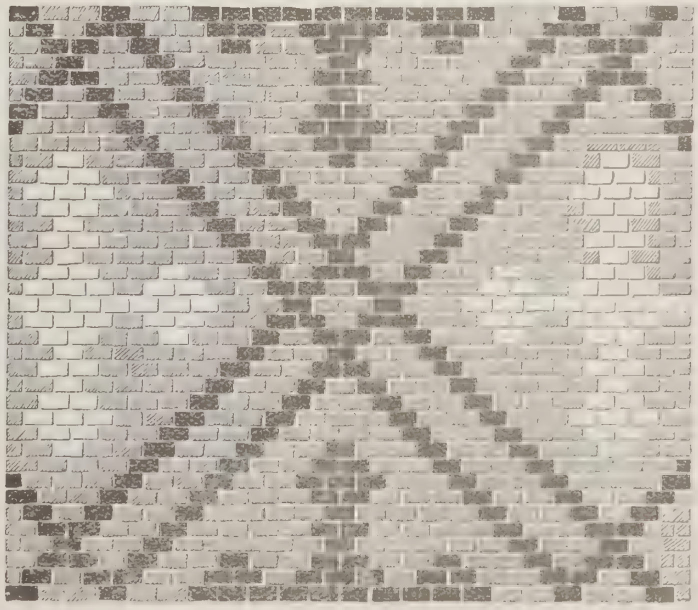
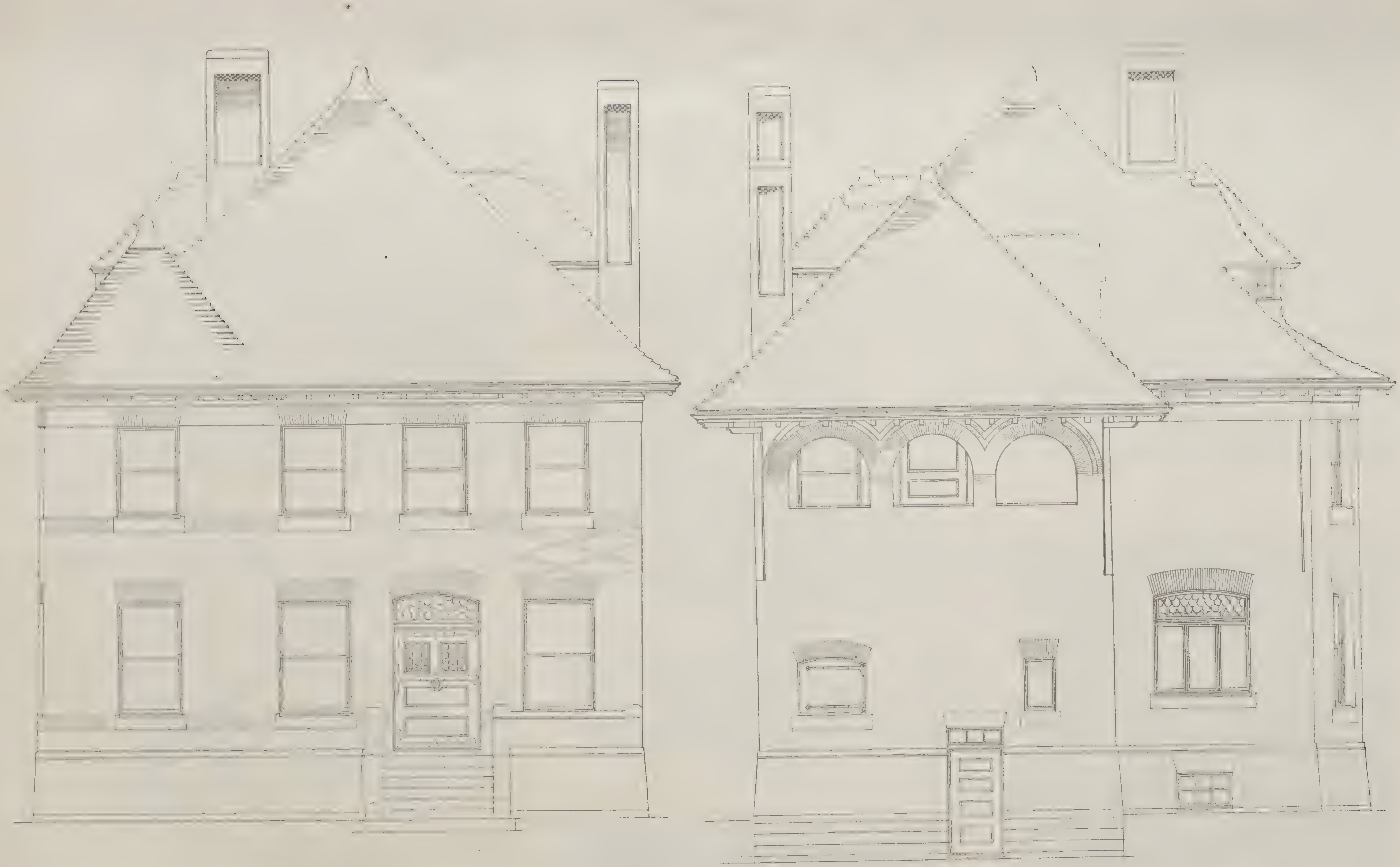


Fig. 30.

GEOMETRICAL PATTERNS IN BRICKWORK. PLATE III.



FRONT AND REAR ELEVATIONS, AT ONE EIGHTH INCH SCALE, OF RESIDENCE AT ALLEGHENY, FOR J. G. PONTEFRACT, ESQ.
MESSRS. LONGFELLOW, ALDEN & HARLOW, ARCHITECTS, BOSTON AND PITTSBURGH.
See photograph on page 251 and plans on page 252.

THE BRICKBUILDER.

AN ILLUSTRATED MONTHLY DEVOTED TO THE ADVANCEMENT OF ARCHITECTURE IN MATERIALS OF CLAY.

PUBLISHED BY

The Brickbuilder Publishing Company,

CUSHING BUILDING, 85 WATER STREET, BOSTON.

P. O. BOX, 3282.

Subscription price, mailed flat to subscribers in the United States and Canada . . . . . $2.50 per year
Single numbers . . . . 25 cents
To countries in the Postal Union . . . . . $3.00 per year

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Entered at the Boston, Mass., Post Office as Second Class Mail Matter, March 12, 1892.

THE BRICKBUILDER is for sale by all Newsdealers in the United States and Canada. Trade Supplied by the American News Co. and its branches.

PUBLISHERS' STATEMENT.

No person, firm, or corporation, interested directly or indirectly in the production or sale of building materials of any sort, has any connections, editorial or proprietary, with this publication.

WITH this issue of THE BRICKBUILDER, the third year of publication is completed. Those of our readers who have been with us from the start will, we think, pardon the pride we take in briefly passing over these years and pointing to the features which have chiefly contributed to the present success of the paper. While there have been changes in the ownership and business management, the editorial management has remained unchanged since the first issue, although Mr. Warren contributed largely to the editorials of the first year.

RESIDENCE FOR J. G. PONTEFRACT ESQ., ALLEGHENY, PA.
MESSRS. LONGFELLOW, ALDEN & HARLOW, ARCHITECTS.

The policy of THE BRICKBUILDER has always been to consider the interests of subscribers first and foremost. We have labored, and not without success, to furnish our readers with useful and interesting material in the field we cover. Looking back over the three volumes, increasing in size with each year, we find many original articles by the most prominent architectural writers, and drawings of much of the best current work in brick and terra-cotta. We have endeavored to follow a broad and liberal policy in the selection of material, but have never allowed the fear of losing a subscriber to stand in the way of rejecting drawings or articles which we considered lacking in merit and interest.

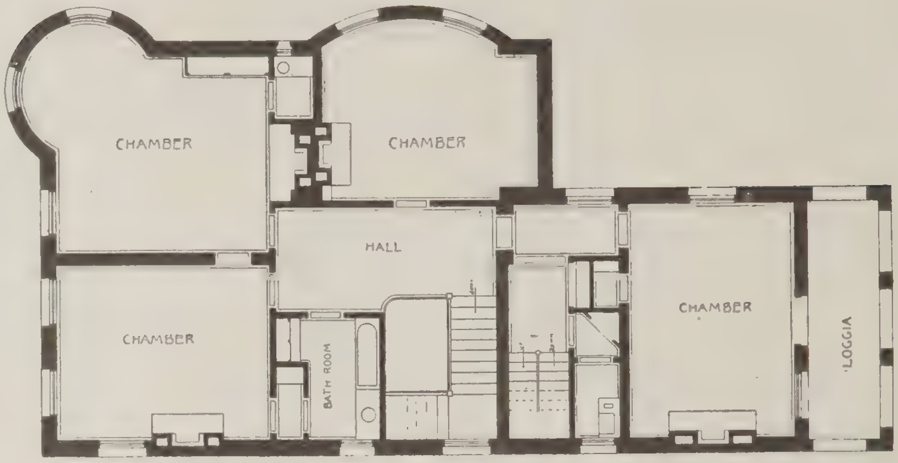
The first year we restricted the size of the paper to sixteen pages and covers, but we published a series of supplements in the shape of photographic reproductions of foreign architecture. Beginning with the second year, a change in the "dress" of the paper was made, which we think was an improvement, and with the March number of that year the present cover (designed by Mr. Harold Magonigle, the last Rotch Scholar) was adopted. The paper was somewhat enlarged and the amount of illustration in the text was considerably increased. The supplements were, however, discontinued, and it was only then that we discovered their popularity. So decided was the call for them from subscribers that some plan for systematically publishing photographs of foreign architecture was sought, and after due consideration it was decided to reprint George Edmund Street's well-known work on "Brick and Marble in the Middle Ages," using this as a vehicle for abundant supplementary illustration. How well this has been carried out our present readers can testify.

With the current year many important additions have been made, including the technical departments of *Fireproofing*, *Mortars and Concretes*, *The Mason Contractor*, and *The Manufacturer*. Each of these is developing into a substantial periodical by itself, and it has been our dream that in the course of one or two years the last half of the paper should be given up to these departments, each edited by a specialist, and forming so many complete periodicals, gathered under the covers of the parent publication. This year has also witnessed the first part of Mr. Dillon's careful and able translation of *L'Art de Batir chez les Romains*, by August Choisy, another out-of-print work. We have also inaugurated a series of letters describing the recent brickwork of the principal American cities, our staff of contributors numbering some of the best known architects in their respective localities.

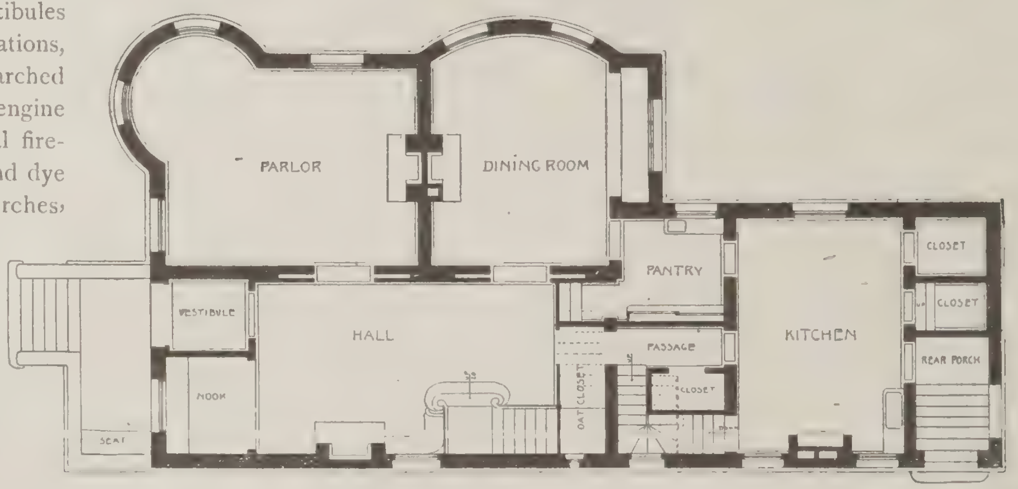
There is now a word to be said concerning the future. It may not fall to the present editor's lot to guide the paper after this month, and promises regarding details cannot be made. In view of his retiring, however, he has made a special endeavor to provide a programme which should satisfy all present and prospective subscribers. Of course, the regular features of the current year will be retained, and interest attaches in particular to the special features.

These will be found announced in detail, upon another page. Should you demand an apology for editorial shortcomings in the three years now closed, let us make it by presenting to you a list of writers whose work will more than make amends for our failures: Mr. C. Howard Walker, Prof. Allan Marquand, Mr. H. Langford Warren, Mr. R. Clipston Sturgis, Mr. Ralph Adams Cram, Mr. Bertram G. Goodhue, and Mr. Charles H. Alden, your special contributors for next year.

ENAMELLED brick are meeting with increasing favor in this country as a material of utility and beauty for building and other purposes, and new fields in which they can be used are constantly presenting themselves. They are especially adapted to elevator wells, vestibules and hallways, waiting-rooms of railroad stations, sanitaries of public and private buildings, arched ceilings, hospitals, libraries and colleges, engine and boiler rooms, restaurants, ornamental fireplaces, stables, chemical vats for mills and dye works, dark basements, bank vaults, churches, theatres, bowling alleys, swimming tanks, tunnels, kitchen brick ranges, and markets. Enamelled brick have won such favor in England that the municipality of London requires that all courts and alleys be built of this material. It reflects light, is fireproof, acquires no odor, is impervious to moisture, and forms a finished surface which is highly ornamental.



SECOND FLOOR PLAN



RESIDENCE OF J. G. PONTEFRACT, ESQ., ALLEGHENY, PA. SEE PLATE 94 AND PAGE 251.

RARITAN
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FIREPROOF FLOOR ARCHES.

FOR some years the question of the strength of the various types of floor arches placed upon the market, the merits of the various forms in which we use fire-clay, the merits of the various kinds of material which have been proposed for use in connection with the subject, and comment upon the widely differing practice obtaining in Europe and America, have all formed a subject for discussion or argument. Tests of various kinds have been made and published, only to be picked to pieces by other parties interested; and all the time the keenest of trade rivalry has gone on, forcing the quality, price, and amount of material used down until it is sometimes a wonder that the stuff holds together long enough to get into the building. Various makers have claimed strength for their arches which no recorded tests bear out. Many of them publish tables of strength which, in the light of tests already made, appear to be either entirely at variance with good engineering practice, or absurd.

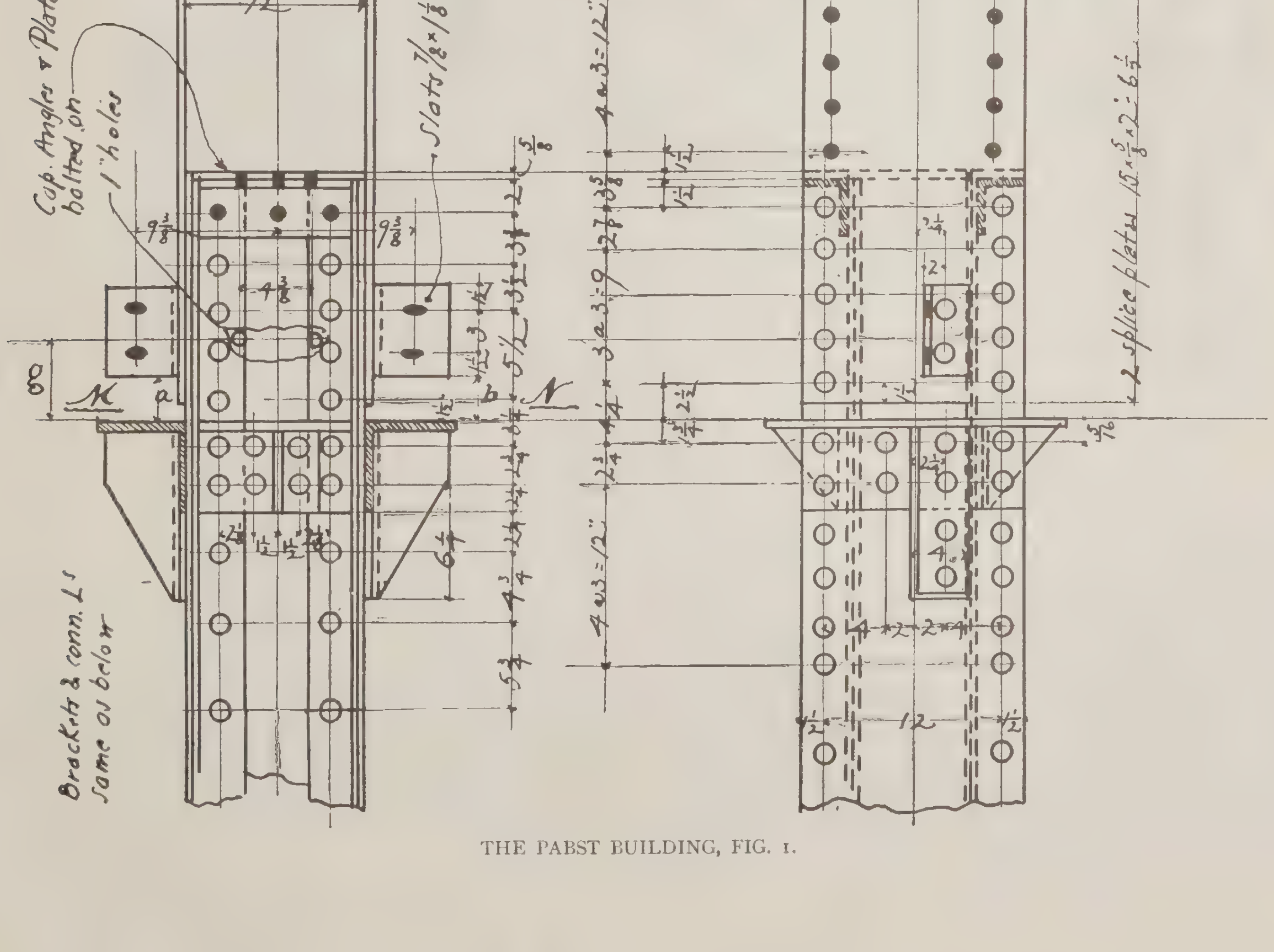
The whole subject is one which requires to be carefully gone over, so as to determine whether or not any saving can be effected in material, whether or not the amount of material used can be so distributed as to increase the strength of the floor, and so as to truly tell us what the safe strengths actually are.

In order to aid in bringing some order out of this chaos, we have had a testing machine specially built by the Watson & Stillman Hydraulic Company, of New York, and have arranged with the various prominent makers of fireproof floor arches, and with those who desire to introduce new material, believing that they have something which is superior to the ordinary types, to construct a series of arches, all of which have been, or will be, tested to destruction under carefully observed and recorded conditions. Quite a number of tests have already been made, and others are in progress, all indicating that certain very interesting results will be developed. It is our intention, in the succeeding numbers, to consider the following points: —

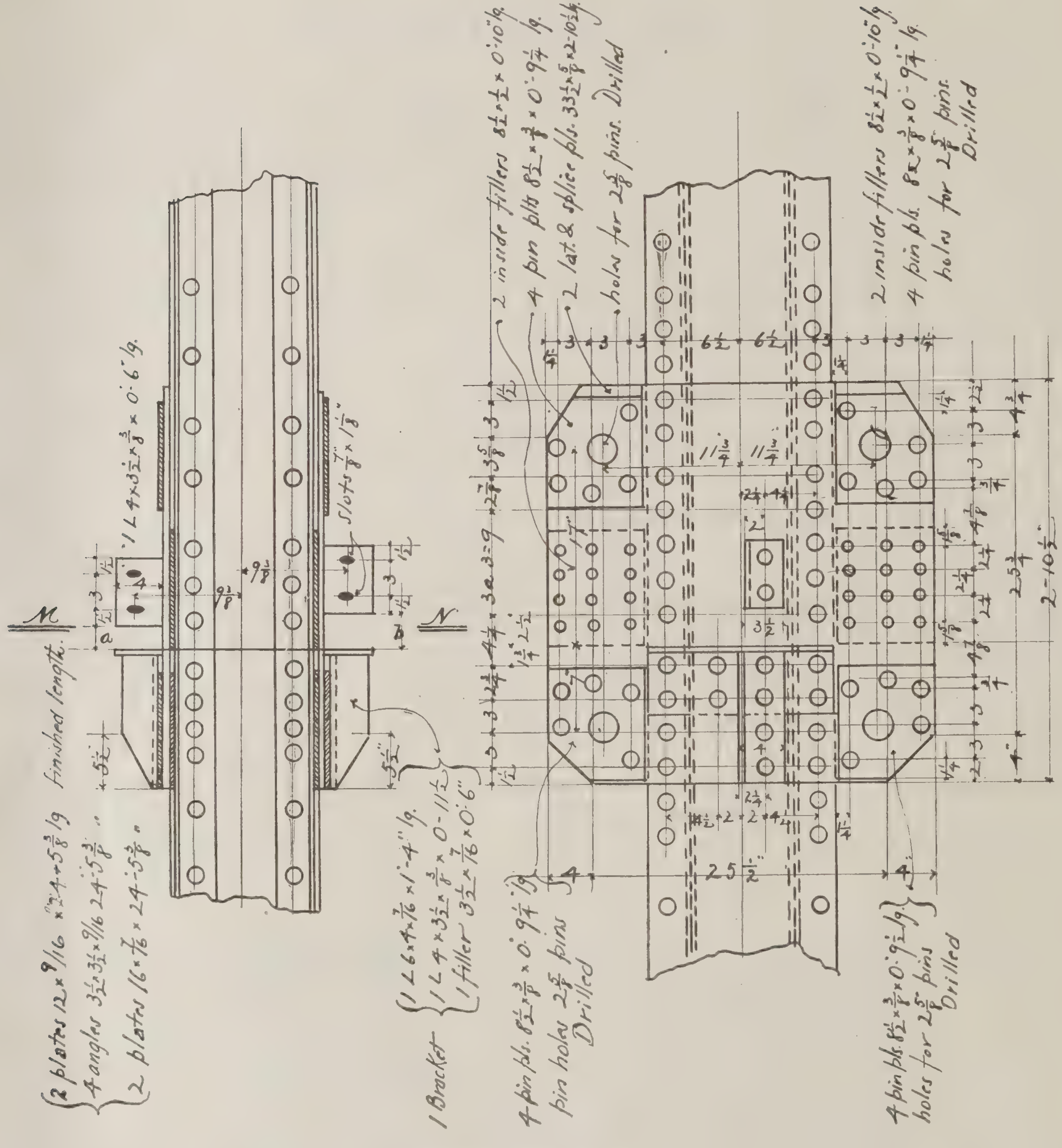
First. We shall give a brief summary of all of the published tests heretofore made, drawing certain general conclusions therefrom.

Second. We shall present details of all of the tests above outlined, and which we have made, recording everything which may be of interest in connection therewith, and illustrating them with numerous photographs, showing the method of fracture, the action of the arch during fracture, and giving graphic diagrams of the way in which the load was applied to the arches, and the way in which the arches acted under these loads.

Third. We shall then follow with a complete description of the testing machine and its method of calibration; fundamental formula applicable to the solution of the question of strength of the various forms of arch employed; the proper consideration of the proper factor of the safety to be used, and the meaning of the same; the effect on the arch of various forms of load application; the effect of the position of tie rods on the strength of the arch, and their proper spacing and location; the relative values of the various forms of skew-backs used in ordinary flat-arch construction and in segmental construction; the relative values of various kinds of mortars in the various forms of


Cap. Angles & Plate bolted on
1" holes
Slots 7/8 x 1 1/8
12"
9 3/8
9 3/8
4 @ 3 = 12"
4 @ 3 = 12"
M
N
a
b
Brackets & conn. L's same as below
2 splice plates 15 x 5/8 x 2' 6 1/2"
2"
11"
2"
12
5/16

THE PABST BUILDING, FIG. 1.


2 plates 12 × 9/16 × 24-5 3/8 l/g finished length.
4 angles 3½ × 3½ × 9/16 24-5 3/8 "
2 plates 16 × 7/16 × 24-5 3/8 "
1 L 4 × 3½ × 3/8 × 0-6 l/g.
Slots 7/8 × 1 1/8
M
N
1 Bracket
1 L 6 × 4 × 7/16 × 1'-4" l/g.
1 L 4 × 3½ × 3/8 × 0-11½
1 filler 3½ × 7/16 × 0-6"
4 pin pls. 8½ × 3/8 × 0-9¼ l/g.
pin holes 2 5/8 pins Drilled
2 inside fillers 8½ × ½ × 0-10 l/g
4 pin plts 8½ × 3/8 × 0-9¼ l/g
2 lat. & splice pls. 33½ × 5/8 × 2-10¼ l/g
holes for 2 5/8 pins. Drilled
2 inside fillers 8½ × ½ × 0-10 l/g
4 pin pls. 8½ × 3/8 × 0-9¼ l/g
holes for 2 5/8 pins Drilled
4 pin pls. 8½ × 3/8 × 0-9½ l/g.
holes for 2 5/8 pins Drilled
25½
2-10½

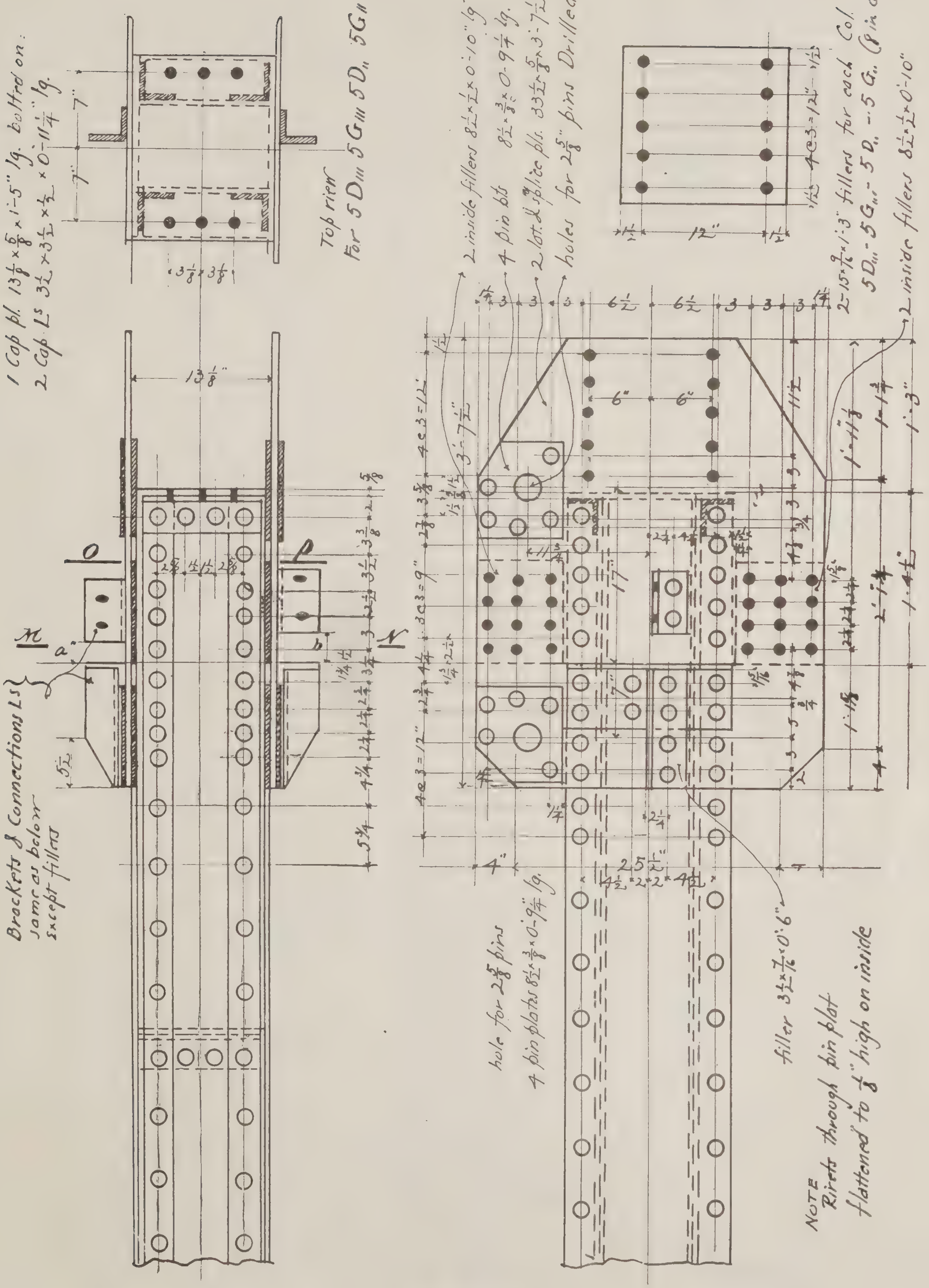
THE PABST BUILDING, FIG. 2.

flat arch; the proper relation of the span to depth *per se*, and also considered in the line of the fact that the arch is, after all, but a filling of great strength intended to be used in the building; the elements of strength and weakness in the various forms of flat arch now used, the question of strength of the various forms of combination arches, such as the concrete iron, plaster iron, and cinder iron forms of arch, as well as the corrugated-iron segmental arch, tile arches, and as many different forms and makes of arch as it is possible to have built. It is, of course, to be understood that it is impossible to make very extended series of tests to elucidate each of these various points, and this must not be expected. All of the arches which are built under our own supervision will be carefully selected, to give the best possible results, and any defects which occur in any of the blocks, or which exist inherently in any of the material, will be described.

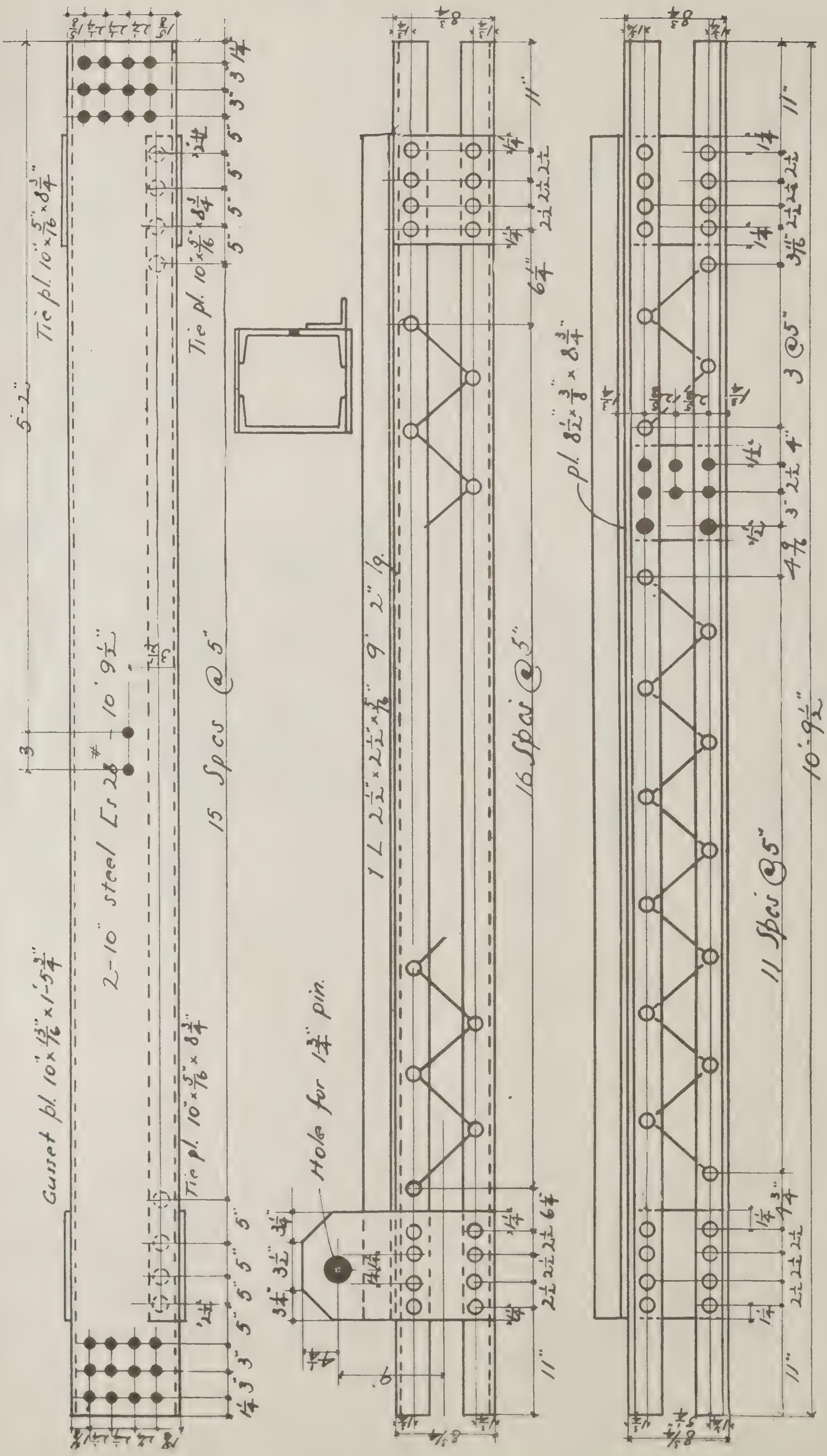
Fourth. A summary will be given of all of the results, and a comparison of the result obtained by calculation from tests of part of arches, with the results obtained by testing the completed arch.

Finally, to the end that the tests may be made as complete as possible, and so that no points of interest may be omitted, it will give us pleasure to hear from any of our correspondents, suggesting points of especial interest for investigation, or suggestions which will tend to make the tests of more universal interest and applicability.

Any arches will be tested which are erected under our supervision within a half-day's travel of New York City, and which are not of over seven-foot span.


1 Cap pl. 13 1/8 × 5/8 × 1'-5" lg. bolted on:
2 Cap Ls 3½ × 3½ × ½ × 0'-11¼" lg.
Top view
For 5 D111 5 G111 5 D11 5 G11
13 1/8"
O
P
M
N
a
b
Brackets & Connections Ls same as below except fillers
2 inside fillers 8½ × ½ × 0'-10" lg.
4 pin bts 8½ × 3/8 × 0'-9¼ lg.
2 lat. & splice pls. 33½ × 5/8 × 3'-7½" lg.
holes for 2 5/8" pins Drilled.
2-15 × 9/16 × 1'-3" fillers for each Col.
5 D111 - 5 G111 - 5 D11 - 5 G11 (8 in all)
2 inside fillers 8½ × ½ × 0'-10"
4 @ 3 = 12"
3 @ 3 = 9"
3'-7½"
25½"
hole for 2 5/8 pins
4 pin plates 8½ × 3/8 × 0'-9¼" lg.
filler 3½ × 7/16 × 0'-6"
NOTE
Rivets through pin plat
flattened to 1/8" high on inside

THE PABST BUILDING, FIG. 3.


Tie pl. 10 × 5/16 × 8 3/4"
5'-2"
Tie pl. 10 × 5/16 × 8 3/4
Gusset pl. 10 × 13/16 × 1'-5 3/4"
2-10" steel [s 28#
10' 9 1/2"
3
Tie pl. 10" × 5/16 × 8 3/4"
15 Spcs @ 5"
Hole for 1 3/4" pin
1 L 2 1/2" × 2 1/2" × 5/16" 9' 2" lg.
16 Spcs @ 5"
11"
6 1/4"
pl. 8 1/2" × 3/8" × 8 3/4"
3 @ 5"
11 Spcs @ 5"
10'-9 1/2"
8 3/4

THE PABST BUILDING, FIG. 5.

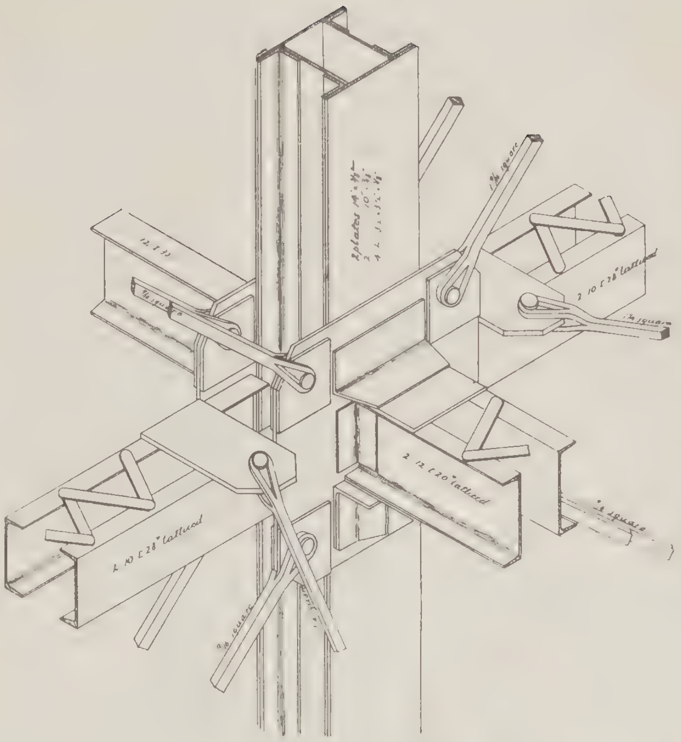
THE STEEL WORK IN THE PABST BUILDING.

THE evolution of the many-storied office building with skeleton steel construction from the few-storied building has taken place during the last seven or eight years. This evolution made many changes in construction to satisfy the increased loads and stresses; thus wooden columns were supplanted by cast-iron, and the latter were again displaced by riveted wrought-iron, and later by riveted steel columns. The changes followed in identically the same order as in bridge building. It was, therefore, quite natural that the empirical methods of the foundries and architectural iron works were supplanted by the exact methods of the bridge engineer. Not only are buildings carried to much greater height than formerly, but the proportion of height to least lateral dimension has increased very much. The stresses produced by the wind pressure must, therefore, be provided for.

The first building in which constructive details were designed to take care of the stresses induced by the wind was the Pabst office building, at Milwaukee. The steel work for this building was designed in May, 1891, and the erection completed June, 1892.

Up to the time that the Pabst Building was designed, column connections in high buildings subjected to wind stresses were made by four bolts passing through two horizontal flanges. This detail was used in a number of high buildings in Chicago, but in the Pabst Building the column connections consist of two longitudinal splice plates riveted to the tops of columns and connected to the bottoms of the next story of columns by field rivets, as shown in Fig. 1. These longitudinal plates were extended laterally to provide connections for the horizontal wind struts and the diagonal wind rods, as shown in Figs. 2 and 3.

The typical detail showing longitudinal splice plates with struts and rods attached is shown in Fig. 4, and the strut is shown in Fig. 5. Fig. 6 shows bracket of exterior or wall columns to carry brick piers; the bracket in this case is 12½ x 37 inches. The details show the columns in two-story lengths.



THE PABST BUILDING, FIG. 4.

Since the construction of the Pabst Building the longitudinal splice-plate connection for columns has been used by others in a number of buildings. Among other buildings we mention the Union Trust Building in St. Louis; the Young Men's Christian Association and Marquette buildings in Chicago; the American Surety Building, now building corner Pine and Broadway, New York. The longitudinal splice-plate connection makes a much stiffer joint than the old

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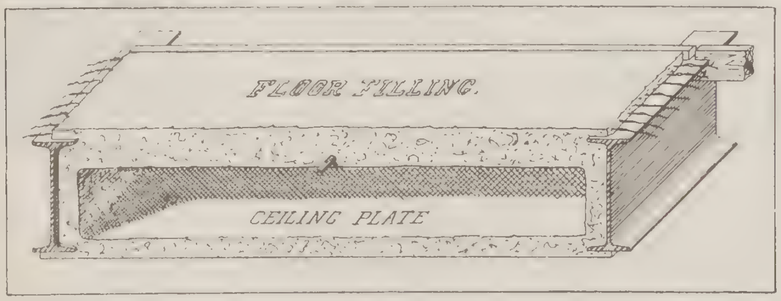

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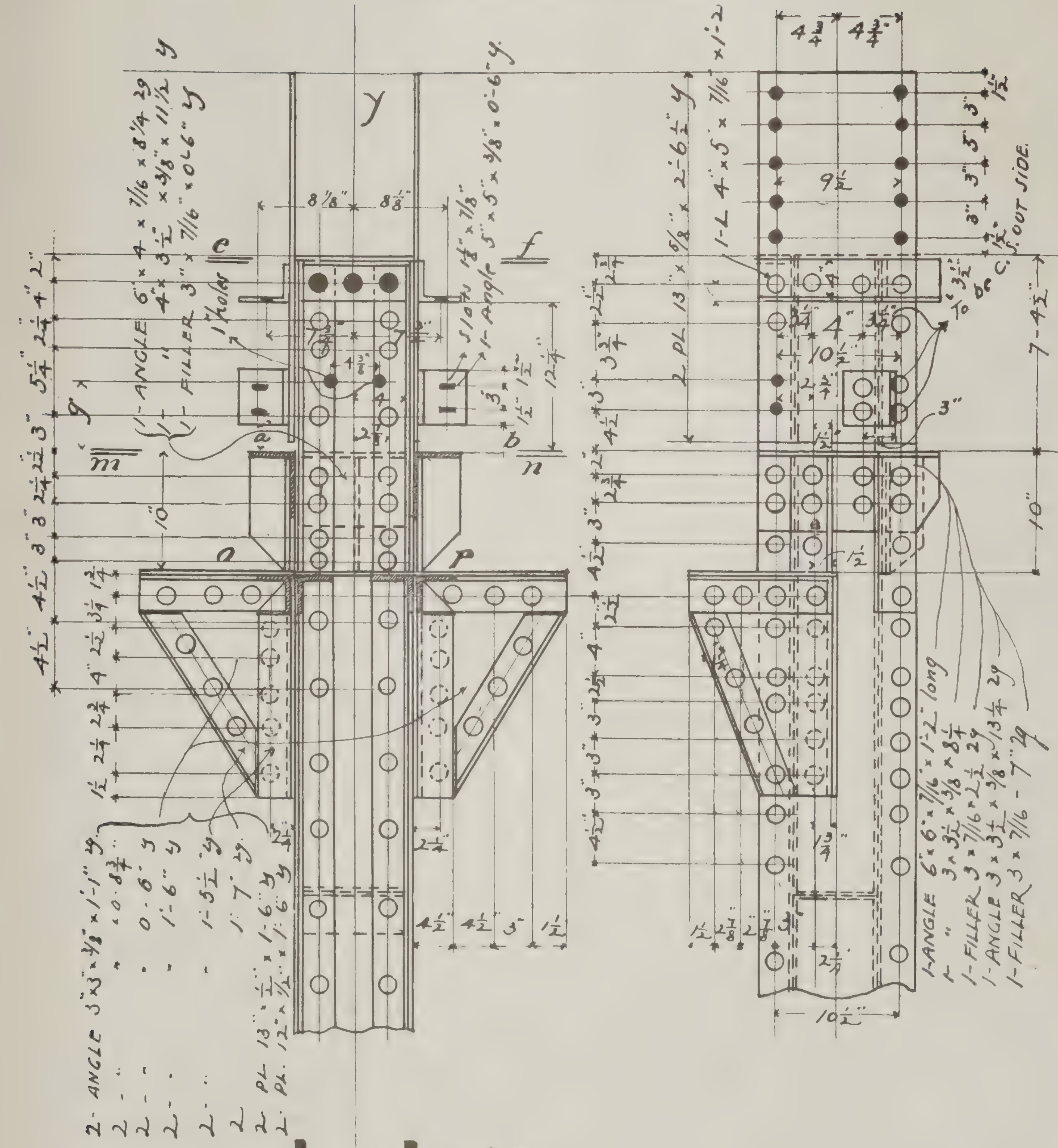
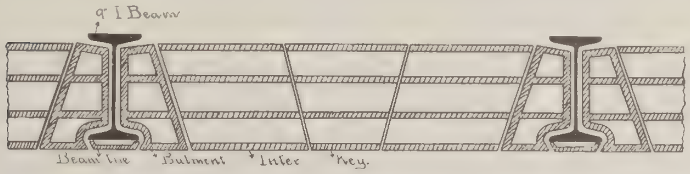

y
y
c
f
g
m
n
o
p
a
b
8 1/8"
8 1/8"
4 3/4
4 3/4
9 1/2
10 1/2
10 1/2
1-1 1/2"
1-0 1/2"
7-4 1/2"
10"
12 1/4
1- ANGLE 6" x 4 x 7/16 x 8 1/4 29
1- " 4" x 3 1/2 x 3/8 x 11 1/2
1- FILLER 3" x 7/16" x 0'-6" 29
1 1/4 holes
5/10 1 1/4 holes
1- Angle 5" x 5" x 3/8 x 0'-6" 29
2 PL 13" x 5/8" x 2'-6 1/2" 29
1-L 4" x 5" x 7/16" x 1'-2
5/8 OUT SIDE.
2- ANGLE 3"x3"x3/8 x 1'-1" 29
2- " " x 0-8 3/4
2- " " 0-6 29
2- " " 1'-6" 29
2- " " 1'-5 1/2 29
2 " 1'-7" 29
2 PL 13" x 1/2" x 1'-6" 29
1- PL 12" x 1/2 x 1'-6" 29
1-ANGLE 6" x 6" x 7/16 x 1'-2" long
" " 3 x 3 1/2 x 3/8 x 8 1/4
1-FILLER 3 x 7/16 x 2 1/2 29
1-ANGLE 3 x 3 1/2 x 3/8 x 13 1/4 29
1-FILLER 3 x 7/16 - 7" 29
1-PL. 12" x 1/2 x 3'-1" long.

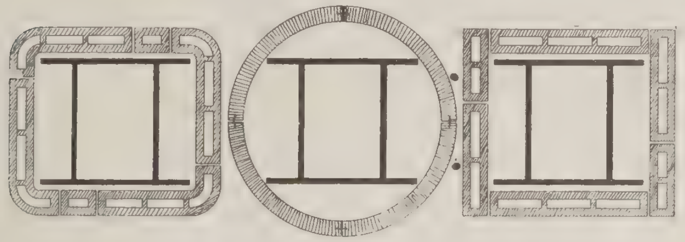
Section. o. p.

THE PABST BUILDING, FIG. 6.

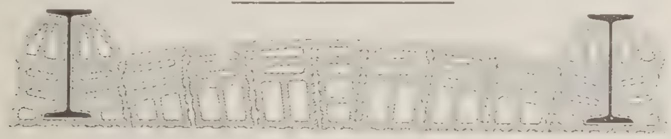
connection, and easily permits making good details for the connection of the wind members. All of this is so clearly shown in the cuts as to require no further description. Mr. S. S. Beman, of Chicago, was the architect of the building. The details herewith illustrated were designed by Mr. Albert H. Wolf, M. I. M. E., consulting and contracting engineer, Chicago, and the work was also erected by him.



SECTIONAL VIEW THROUGH CENTRE OF NINE-INCH ARCH TILE AS USED FOR FLOORS OF THE PABST BUILDING.



TWO-FOOT COLUMN COVERINGS IN THE PABST BUILDING.
Pioneer Fireproof Construction Co., Chicago.



A NEW PATENT FOR HOLLOW TILE FLOORS.

Editor of the Brickbuilder: New York, Oct. 23, 1894.

Sir, — I enclose a print of a design for floor construction, a patent for which was recently granted to the writer.

The present flat hollow tile floors, termed either "old style" or "end construction," have all bearing ribs horizontally which do not admit of the determining of their dimensions according to the load they are designed for. This is proven, as no building law has any provision in this direction, and the use of the height of the section as well as the thickness of the tile webs is left entirely to the option of manufacturers and builders. We see used sometimes for the same purpose twelve-inch blocks with moment of resistance of sixty (section twenty-four square inch), ten-inch blocks moment of resistance one hundred (section sixty square inch), and finally six-inch blocks moment of resistance thirty (section four square inch), for one and the same load and purpose. The reason for this is because the parts which really are bearing are not distinct enough to be determined, and the line of resistance has no connection with the material itself. I have already shown by my own tests (in *Engineer's Record*, May 26) that strength attained by the common hollow tile floor is mainly derived from the use of strong cement mortar, making of the whole one monolithic piece; and this strength is even far larger than that one derived from the arch-like action, because the section devoted to it is far too small to carry anything. Thus as soon as the joint breaks a sudden collapse of the arch in smashing the haunches has been the outcome of most tests. The proposed design shows the material arranged in the line of resistance, while the lower part is merely a filling to get a flat ceiling. As soon as a sufficient amount of this new system can be manufactured a test to get at the merits will be made. I propose also to make a sand test, which is a test without any mortar at all, only a filling of the joints with sand. Using this test on all the systems in question, it will be shown how far they rely on the cohesion in the joints or not, and it corresponds to cases where joints are not carefully made.

I have termed the system "Austria," following the inscription of an Austrian emperor whose motto was represented by "A. E. I. O. U.," which means *Austria erit in orbi ultima*, or, freely translated from the Latin, "Austria will be the longest lasting empire in the world." This may be too much of a boast for an empire, but I consider it a good name for a fireproof floor construction.

Yours truly,
Fr. Von Emperger.

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AMERICAN CEMENTS.

II.

THERE are two distinct classes of rock cements in this country, although they are not distinguishable except by analysis.

The ordinary consumer will never note the difference, as the action of both classes is the same under like circumstances.

They are classified as double (bi) and triple (tri) silicates, and their compositions are known as

1. Silicate of lime and alumina.
2. Silicate of lime, magnesia, and alumina.

The combining proportions of these silicates differ materially, as the former requires a greater percentage of silica than does the latter.

During the year 1893 the production of American rock cements amounted to 7,411,815 barrels, and the proportions of the two classes were as follows: —

1.	Bisilicates	2,495,268 barrels.
2.	Trisilicates	4,916,547 "
	Total	7,411,815 "

The percentages are approximately as follows: —

$$\left.\begin{array}{lll}1. & \text{Bisilicates} & 33.67\\ 2. & \text{Trisilicates} & 66.33\end{array}\right\} = 100$$

Although the terms "double" and "triple" silicates are used to distinguish the two classes, it is not intended that the rule is at all absolute.

On the contrary, it is wellnigh impossible to find a cement that can rightfully be classed as a double silicate that does not contain a small percentage of triple, and oftentimes a large percentage of single, silicates; therefore, the position of a cement in this classification is determined by the particular form of silicates which in its composition predominates.

As far as durability and general excellence are concerned, no distinction can be drawn between these two classes of cements. They have been produced in this country for many years, the former since 1818, and the latter since 1824. The durability of either depends not as to whether it be a double or triple silicate, but rather upon the nearness with which it approaches true combining proportions. Whichever approximates this standard closest is, theoretically at least, the better cement; but, practically, it has been demonstrated by long-continued use that there may be an excess of he two bases, lime and magnesia, without detriment to the enduring qualities of the cements whether used in air or water.

A cement containing an excess of alumina will, when used below ground or in fresh water, remain stable and firm for an indefinite period, but is apt to disintegrate in masonry exposed to the atmosphere in a cold climate. Fortunately the rock cements of this country are not open to this objection, except to a very limited extent, as less than two per cent of the total output can fairly be so rated.

It is often stated by writers, especially those who advocate artificial or so-called Portland cements, that the rules governing chemically combining proportions must be strictly adhered to; that an excess of lime is not only objectionable, but positively dangerous.

If this be true, how are we to reconcile ourselves to its acceptance, while we have before us the unvarnished fact, that the natural rock hydraulic limes of France have been in use hundreds of years before Portland cement came into existence, and are in use to this day in vastly increasing quantities in sea water, in earth foundations, in masonry exposed to the atmosphere, in concrete blocks and arches, in monoliths, and in important works of every kind, and yet they contain not less than forty per cent of free lime?

Evidently there is a mistake somewhere, but rather than question unduly, hastily, or without apparent reason, the wisdom of so many of the eminent scientists who have persisted in this somewhat arbitrary view of the subject, we prefer to state such facts as are within the experience of those familiar with the use of cement, and at the same time, by quoting liberally from the works and statements of leading authorities, make clearly evident that the doctrine so maintained is without sound foundation. No cement, be it either natural rock or

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Portland, contains ingredients in exact combining proportions. There is usually a slight variation. Some contain an excess of clay and others an excess of lime or magnesia. These variations are not so great, however, as to prevent prompt induration in air or water.

Much has been written by the advocates of artifical cements of the importance of subjecting cements to a high degree of heat in calcination in order to bring out their best qualities.

According to these writers, cements that cannot sustain a high heat without injury are of a low grade, and, singularly enough, these writers are unanimous in the opinion that all American rock cements are calcined at a low heat, and, therefore, as a matter of course, are, by them, classed as low-grade cements.

It may be stated, in passing, that this is an error on the part of these writers.

There are many American rock cements that stand high in public favor that are calcined to a white heat, the same as that to which Portlands are subjected.

We will defer the discussion of this particular branch of the subject to future papers, and confine ourselves to the elucidation of the various phases met with in a study of American rock cements.

A cement rock that produces the double silicates is a mechanical combination of two chemical compounds, viz., silicate of alumina (clay) and carbonate of lime, while that which produces the triple silicates is a mechanical combination of three chemical compounds, namely, silicate of alumina, carbonate of lime, and carbonate of magnesia.

The last two compounds named are combined in certain fixed proportions, while the clay is seldom so found, as the silica is usually in excess of true combining proportions with alumina.

These, with other compounds relative to the composition of hydraulic cements, will be found in the table of chemical combinations.

It does not follow that because a cement may contain ingredients the proportions of which are not in strict conformity to the law governing chemically combining proportions as ordinarily interpreted, it must necessarily contain an excess of one or more of the bases, for there may be, and often are, found triple, double, and single silicates in one and the same brand of cement; in fact, a cement is improved by diversifications of this character, as we will attempt to show in the course of these papers.

It may be taken as a truism that the essential constituents of a cement rock are carbonate of lime and silica. By calcination the carbonate of lime converts the silica into silicic acid.

Carbonate of magnesia acts in a similar manner to carbonate of lime, and when the two are present with a proportionate amount of silica, hydraulic energy, strength, and durability follow. And, as has been pointed out before, alumina, which is always present by reason of its combination with the only quality of silica obtainable, is not particularly objectionable unless it is in excess. It is not so good a base as lime or magnesia, and when in excess impairs the indurating value of the cement.

All cement rocks contain, in varying proportions, oxide of iron, soda, potash, etc., which are not objectionable if not in excess. The former gives color to a cement. One per cent will produce a yellowish cast, two per cent a drab, and four per cent produces a dark color. It has no effect whatever on the quality of a cement; it is simply an adulterant, and is usually in such limited amount as not to detract from, while it certainly does not add to, the value of a cement.

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The alkalies, soda and potash, when present to the extent of three to five per cent, add much to the quality of a cement, as they have much to do as an aid to the caustic bases, lime and magnesia, in the conversion or reaction of silicate of alumina into silicic acid and alumina, or forming a silicate that is soluble in acids.

But the constituents, silicic acid, lime, magnesia, and alumina, being the essential ingredients in the formation of hydraulic cements, the non-essentials named will, for the sake of brevity and space, be omitted in our calculations.

CHEMICAL COMBINATIONS.

1.	Oxygen	28.57	= CaO. Lime.
	Calcium	71.43	
2.	Oxygen	40.04	= Mgo. Magnesia.
	Magnesium	59.96	
3.	Oxygen	53.27	= SiO_2. Silica.
	Silicon	46.73	
4.	Oxygen	47.00	= $Al^2 O_3$. Alumina.
	Aluminum	53.00	
5.	Carbonic Acid	52.40	= $MgCO_3$. Carbonate of magnesia.
	Magnesia	47.60	
6.	Carbonic Acid	44.00	= $CaCO_3$. Carbonate of lime.
	Lime	56.00	
7.	Silica	54.68	= $Al_2 SiO_3$. Silicate of alumina.
	Alumina	45.32	
8.	Silica	34.91	= $2 CaO, SiO_2$. Silicate of lime.
	Lime	65.09	
9.	Silica	42.91	= $2 Mgo SiO_2$. Silicate of magnesia.
	Magnesia	57.09	
10.	Silica	26.92	= 100 Bisilicate of lime and alumina.
	Lime	50.20	
	Alumina	22.88	
11.	Silica	38.50	= 100 Bisilicate of lime and magnesia.
	Lime	35.89	
	Magnesia	25.61	
12.	Silica	29.01	= 100 Trisilicate of lime, magnesia, and alumina.
	Lime	27.04	
	Magnesia	19.29	
	Alumina	24.66	

With the aid of the foregoing table, and the analyses of the various cements of this and other countries, which will be given later, it will not be a difficult matter to deduce conclusions which, it is hoped, may be of interest to the reader.

URIAH CUMMINGS.

It is ridiculous to suppose that with the purest chalk and the purest clay the English possess, they cannot make better cement than the Germans, who have none such. In THE BRICKBUILDER, a journal published in Boston, articles on cements and cement tests have recently appeared, in which two classifications of cement were made: —

1st, German cements as of first quality.

2nd, English cements, generally bracketed with Belgian cements, as of second quality,

This is a serious matter for the commerce of this country, and is well entitled to the attention of engineers, who should show how thoroughly unfounded is such a supposition." — *Fairplay* (London).

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CONCRETES, CEMENTS, AND MORTARS: OLD AND NEW.

THE "White City" of antiquity was Rome, and most of the so-called marble houses of the Augustinian period were not such in reality, but owed their stone-like appearance to the plasterer's art, which at that time had reached a high state of perfection, and gave to stone the appearance and induration of the finest marble.

It is on record that some of this plastering, which in some particulars resembled the white "staff" used on the World's Fair buildings, lasted for centuries, but the art which enabled man to make and apply this material was lost before the examples perished.

It is evident the ancients, at all events the Egyptians, Greeks, and Romans, possessed a knowledge of eminent mortars and cements, as is proven by the phenomenal strength and durability of the remains of edifices still standing to receive their tribute of admiration. Doubtless much was due to the durability of the stone used, but builders of to-day know that more was due to the superiority of the mortar employed. True, the action of time has fostered improvement and aided petrifaction, but had the mortar been composed of inferior materials, or manipulated unskilfully, it would have been rotten centuries ago, and the stones it held together would have been lost to us forever.

In all highly civilized communities good mortar was and is a necessity. Indeed, the quantity of mortar used in any community may almost be accepted as an index of its civilization.

The city of Nineveh has left us comparatively nothing of its history, as it was a city of mud and unburnt clay, adobe walls, and loamy mortar. Of Babylon we know more, as it was a burnt-brick built city, with walls bonded together with bituminous mortars. Egypt, that cradle of the arts, built the massive pyramid of Sackkara of bricks cemented with Nile silt! later, she raised her temples and pyramids of hard syenite, and held them together with imperishable asphaltic mortars; but the greater works of this wonderful people were held together with a mortar formed by an admixture of hydrate of lime and Nile silt. The Greeks, in their earlier public buildings, dispensed with mortar to some extent, and used dowels or pins made of cypress wood to hold the stones in place. All their joints, however, were rubbed or ground together, so that the junction of the stones was almost perfect; later on, mortar was used in many of their structures. The Romans, the most practical builders of antiquity, sur-

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SPECIAL BRANDS:

"OBELISK" and "U. S. G."

MANUFACTURERS OF

AKRON CEMENT.

"AMERICAN SEAL."

Mortar Stains. These are in four standard colors, RED, BROWN, BLACK and BUFF, furnished either in pulp or dry. They are made from such pigments only as I have found best adapted for the purpose. They are strong and durable and can be relied upon in every case. They mix easily with Lime or Cement. Special colors made to order.

AND

Elastic Oil Cement. This is made expressly for laying or embedding Slate and Tile Roofs, repairing leaks around Chimneys, Dormer Windows, Skylights, Scuttles and Fire Walls; it is waterproof and will not crack. Made in three colors, Red, Brown and Black.

WILLIAM CONNORS, Manufacturer, Troy, N. Y.

W. H. GATES, Agent, 30 Kilby Street, - - - - - - - - BOSTON, MASS.

passed all peoples, ancient or modern, in their knowledge of the materials they made use of in their building operations, and it is to their intelligent attention to mortar making that we moderns are enabled to see the work of their hands. The importance of the manufacture of mortar was such that in all large works, national, municipal, or private, it was deemed necessary to employ supervising officers, called Ediles, whose duties were to inspect materials and superintend the manipulation of all mortars and cements used in the building.

We may glean some idea of the labor expended in the making of mortar from Vitruvius, who says: "That men mixed the ingredients by beating them with staves until the whole mass was smooth and plastic."

In another place the same author says: "The builders mixed puzzolana with lime to give it (the mortar) greater strength, and piers built in the sea would be as strong as if built on land, as the mortars made this way would harden just as well in the water as on the land."

It is quite evident also that the Phœnicians were aware of the qualities of puzzolana, for some of the docks and wharves of Carthage were built of stone and cemented together with a mixture of lime and puzzolana. It is difficult at this date to trace to its source the invention of lime-mortar, but it is due either to Egyptian or Phœniciana ingenuity, and was a grand stride in the direction of civilization and culture, and it is curious to think that for several thousand years no further progress in its manufacture was made. Indeed, until about the commencement of the present century, common lime-mortars were made in the same manner that was adopted four thousand years ago.

In the matter of producing a water-resisting mortar, much more skill and knowledge were required; yet we find that the possession of this knowledge by the ancients antedates the Christian era by several centuries, as the use of puzzolana mixed with lime to form a cement was known to both Phœnicians and Romans long before Vitruvius flourished.

The discovery of the manufacture of a mortar that would set and harden under water was another step forward in human culture, and evinced a knowledge of chemical conditions by the early builders that is really amazing. Hydraulic lime and the modern product of cement were unknown to them, but they seemed equal to the occasion, for they found that a proper admixture of lime, puzzolana, and pounded bricks formed a cement that answered well their purposes.

It is not known at what period the fact was discovered that certain limestones would yield a lime or cement capable of hardening under water. The French writer, Vicat, in the beginning of the present century, was the first to make an extended investigation of the laws governing the action of limes. Up to the middle of the eighteenth century puzzolana imported from Italy and France, and from Germany via Holland, was the standard ingredients for hydraulic mortars in England.

In 1756, John Smeaton, C. E., was intrusted to build a new lighthouse on the site of the Eddystone, which had recently been destroyed by fire, and he set to work to discover some material at home which would resist the action of both surf and sea. The lime from Aberthaw answered his purpose. He investigated the cause, and proved before long that only those limes resist water which, when treated with acids, leave argillaceous residues. The spell was broken, and

MANHATTAN CEMENT COMPANY,

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"GERMANIA" (German Portland Cement).

Positively the best sidewalk cement made.

This statement is based upon reports from consumers throughout the country.

Germania was selected in preference to all others for use in laying the walks in front of the White House, at Washington, on account of its almost perfect color and great durability.

FOR CONCRETE FOUNDATIONS IT HAS NO SUPERIOR.

Pamphlets giving directions regarding mixture of sand for all kinds of work sent on application.

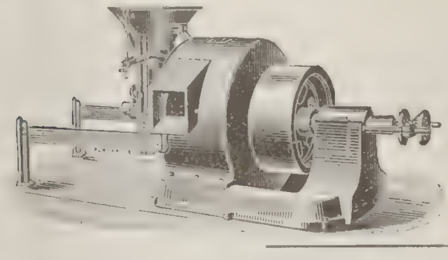
"GLOBE" (Belgian Portland Cement).

Tested by N. O. Olson, Engineer of Fairbank's Testing Dept., with the following results: Average tensile strength of five briquettes Neat Cement, seven days, **462 pounds per square inch.** Average tensile strength of five briquettes, one part Cement, two parts Sand, **172 pounds per square inch.**

The Globe Portland Cement has been furnished to the following contracts:—

Broadway Cable Road, New York City	40,000 bbls.
Foundation Terminal Warehouse, New York City	15,000 bbls.
Foundation Power House, Brooklyn City R. R.	15,000 bbls.
Baltimore Cable Road	10,000 bbls.

BERRY & FERGUSON, Agents for New England, 37 Medford St., (Charlestown District,) BOSTON, MASS.



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FIT ANY MILL FRAME.

Fastest fine grinder known.
Sturtevant Patent Vertical Mill has no rival for reducing ***Plaster, Paints, Chemicals, Carbons, Talc, Soapstone, Slate, Barytes*** and like materials. 30" Mill Costing but $400, grinds to fine powder from 1 to 4 tons per hour. No foundations, no screens, no noise, no dust. Remember that for $400 you have a machine that is ***ready to run*** and that will keep running longer without repairs than any other fine grinder. Send for special circular.

Made of Blocks of Rock Emery set in Metal, making the hardest and most cutting millstone ever built, and not expensive.

A Customer Writes:

SELLERSBURG, IND., June 25, 1894.

We can grind from 70 to 75 bbls. Louisville Cement per hour with your Rock Emery Stones. This is from 10 to 15 bbls. more per hour than our ordinary stones will grind. Since May 3 have dressed these but twice. Ordinary Stones we dress every three days. Rock Emery Stones save us several dollars per week in dressing alone.

CLARK COUNTY C. CO.

RAPID — because Rock Emery has no equal for cutting qualities. ECONOMICAL — because Rock Emery is the most durable grinding surface known. NO EXPERIMENT — because many large manufacturers in your own line already use and indorse them, and hundreds in use for other purposes.

SEND FOR CIRCULARS AND REFERENCES.

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artificial cements followed each other rapidly after that. Parker took out his patent for Parker's cement in 1796. This consisted of lumps of chalky clay gathered from the seacoast. It became known as "Roman cement," because of its being similar in color to the Roman puzzolana. In its action it was somewhat like to our Rosendale. By inference, it followed that hydraulic cements could be produced artificially of lime and clay.

Parker made a number of experiments with clinkers, pulverized limestones, and the calcareous detritus produced by the wear of limestone roads near Leeds, mixed clay with it, and burned it in a kiln at a red heat. He called the resultant "Portland cement," because it was similar in color to Portland stone. The name thus given has clung to this cement ever since, no matter where made.

In 1827 Sir Charles Paisley improved and cheapened the process of manufacture, by selecting English chalk as being best suited to the purpose, owing to its uncrystalline, fine-grained quality. He mixed it with clay from the deposits at the mouth of the Medway, near Chatham, and calcined them. This made a good cement, but as the merits of white-heat calcination were then not known the quality could not be relied upon.

The credit is due to a German, Dr. Fuch, of Munich, of first formulating a scientific theory concerning the manufacture of cement, and stripping it of its mystery. He proved in a prize essay that Portland cement could be made anywhere and from a variety of materials, abundant in every locality. This essay, being translated in several tongues, was the means of raising a host of manufacturers, with the result of bringing disgrace on the manufactured article, as it lacked uniformity of quality, and could not be relied upon, and architects and engineers avoided its use and stuck to old methods.

In 1858 John Grant, a London engineer, made a number of experiments, and so far succeeded in improving the quality that he completed the Thames embankment and the London drainage works without an accident, so far as the cement was concerned. The experiments made by Grant led him to believe that the heaviest cement was the best, and his reputation, which was high, had the effect of spreading abroad the impression that to have weight was of more importance than to be finely ground.

This idea did much harm, even after it had been proven beyond a peradventure that it was fineness, and not weight, that gave to the cement its superior tensile strength. Through the efforts of Reid, Brund, Mann, Newman, and others in England, M. Noel, MM. Chatony and Rivot, and others in France; Dyckerhoff, Michaelis, and Bauschinger in Germany; of Zuirek and Hanenschild in Austria; Gen. Gilmore, W. W. Maclay, Elliot C. Clarke, E. J. Desmith, and F. Kidder, of the United States, the truth has been established that, the materials being good, it is fineness that imparts to the material its good quality. W. W. Maclay, engineer of the New York docks, made between seven thousand and eight thousand tests, to satisfy him-

ATLAS PORTLAND CEMENT.

WARRANTED EQUAL TO ANY AND SUPERIOR TO MOST OF THE FOREIGN BRANDS.

OFFICIAL TESTS, Nos. 3567 and 3568, made by the DEPARTMENT OF DOCKS, New York, March 31, 1894, being part of contract No. 464 for 8,000 barrels.
TENSILE STRENGTH, 7 days, neat cement . . . . 622 lbs.
" " 7 days, 2 parts sand to 1 of cement . . . . . . 332 lbs.
Parts steamed and boiled . . . . Satisfactory.

All our product is of the first quality, and is the only American Portland Cement that meets the requirements of the U. S. Government and the New York Department of Docks. We make no second grade or so-called improved cement.

ATLAS CEMENT COMPANY, 143 LIBERTY STREET, NEW YORK CITY.

Holy Trinity Parish House,

PHILADELPHIA.

Buff and Pompeian Brick Laid
in Clinton Hematite Red.

Messrs. Hewitt & Bro., Architects,
PHILADELPHIA.

Messrs. Dorsey & Smith, Builders,
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High Grade Mortar Colors and Metallic Paints.

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self as to what constituted the best cement, and in every case he found — where materials were chemically equal — that the finer grades were the best adapted for work requiring strength. Mr. E. C. Clarke, of the Boston Maine Drainage Works, made some twenty-five thousand tests with a like result.

Mr. Kidder, who watched a number of tests made at the School of Technology, Boston, arrived at the same conclusion. It may therefore be laid down as an axiom, that, no matter how good the material may be, if it is not ground to a fine texture, it cannot be relied upon. Brands possessing a uniformity of texture will give better results than an admixture of brands, and when once a brand has been found to do all that was claimed for it, and it fills the bill, it is best to stick to that particular brand. A good cement, when properly set, should equal in strength good building stone, and should have a like or greater specific gravity.

At this writing, there are quite a number of brands of Portland cement in the market, many of them being imported from England, Germany, France, and Belgium. Some brands are exceedingly good, while a nnmber of them are inferior to many made in this country. Indeed, some of the Portlands made in Pennsylvania, New Jersey, and other States are as good and reliable as some of the imported high grades, though I am free to confess that but few of our own brands grade as uniformly as the Dyckerhoff or Boulogne makes. Doubtless the quality of uniformity of the two brands named is due to the care and perfection of manufacture, for neither France nor Germany possess raw material in as good a quality as is found in many places in this country.

The English Portland is a mixture of clay, consisting chiefly of silica and alumina and chalk, or nearly pure carbonate of lime. The clay and chalk are ground roughly, and mixed in the proportion of one to three by weight, then again ground under water. The mixture is then allowed to settle and the water to drain off, and the mass is then dried and made into cubes, bricks, or balls, two or three inches in diameter, which are placed in a kiln and heated to a white heat. They are then allowed to cool, and afterwards reduced to an impalpable powder. Unlike natural cements, Portland does not deteriorate when exposed to dry air. Dr. Michaelis, a noted expert on cements, says that the "raw materials, when dried at 212° F., consist essentially of seventy-five to seventy-nine per centum, by weight, of carbonate of lime, and twenty-four to twenty per centum of silicate of alumina, clay. These when burned represent sixty-two and one half to sixty-seven per cent of lime, and thirty-three and one half to twenty-nine per cent of silicates, silica, alumina, oxide of iron, leaving four per cent for carbonate of magnesia and accessories. After the hardening of the hydratal cement, a transformation, by compressive reaction, has taken place into hydrates, silicate of lime as the most important ingredient, in hydrated aluminate of lime, ferruginous lime, hydrate of lime, basic sulphate of lime, and carbonate of lime."

The results of analyses by other investigators by microscope and chemical tests verify the conclusions arrived at by Dr. Michaelis. A preponderance of alumina favors quick setting, while an increase of iron has an opposite effect. The partial vitrification obtained in the burning causes the particles forming the whole to lose their globular character and become laminated or flattened. This feature reduces the bulk and increases the value of the cement, inasmuch as the laminated texture achieves more intimate contact by surface.

The English standard requires these tests, viz., that the cement shall weigh one hundred and ten pounds to the strict Imperial bushel; that it shall pass through a sieve having from one thousand six hundred to three thousand meshes per square inch, and that its tensile strength shall be two hundred pounds per square inch at the end of seven days, the first passed in damp air, and the rest under water. American engineers exact a somewhat higher standard, some specifications calling for a tensile strength of two hundred and fifty pounds to the square inch.

Fred T. Hodgson, C. E.

(*To be continued.*)

ENGLISH manufacturers of Portland Cement have had a meeting to endeavor to form an association which will prevent adulteration of cement. We have just received the stenographer's report, which will be published in part in our next issue.

Alsen's Portland Cement.

The strongest, finest ground, and most uniform Cement in the world. Permits the admixture of more sand than any other, and is the best for mortar or stuccoing.

143 Liberty Street, = = New York.

Peerless Mortar Colors,

RED, BLACK, BROWN, AND BUFF.

Our New Colors are novel and attractive and well worthy of attention.
MOSS GREEN, ROYAL PURPLE, POMPEIIAN BUFF, FRENCH GRAY, COLONIAL DRAB.

All Colors Permanent and Superior to any Article in Use.

SAMUEL H. FRENCH & CO.,

Painters' and Builders' Supplies,

ESTABLISHED 1844. PHILADELPHIA, PA.

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No. 1 BROADWAY, NEW YORK.
"HOFFMAN" ROSENDALE
SUPERIOR FOR WORK UNDER WATER
STANDS EVERY HIGH TEST
ADAPTED FOR HEAVY MASONRY
MADE FROM THE BEST ROCK
ALWAYS RELIABLE
UNIFORM IN QUALITY
STRONGEST OF AMERICAN CEMENTS

CLEVELAND IRON ORE PAINT CO.

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TRADE MARK

MANUFACTURERS OF
HIGH GRADE
MORTAR
COLORS.
ALSO,
Metallic and Graphite Paints,
IN ALL FORMS.

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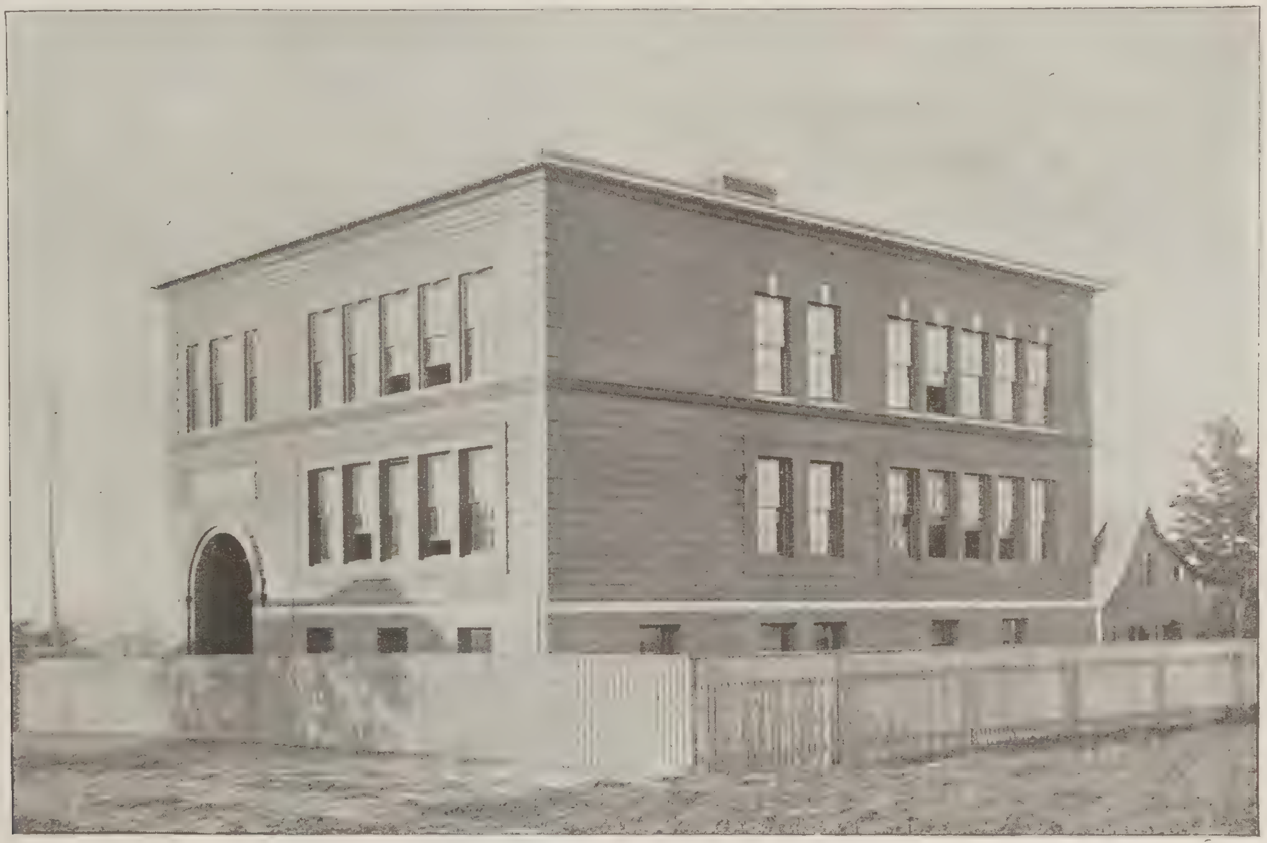
THE MASON CONTRACTOR.

A Department conducted in the interests of the Builder, and the Contractor for Brickwork.



UNION HILL SCHOOL, WORCESTER, MASS EARLE & FISHER, ARCHITECTS.

THE UNION HILL SCHOOL, WORCESTER.

THE side elevation, detail of entrance and first floor plan of this school were published last month. It was built by Henry Mellen & Son, contractors, for $14,000, exclusive of heating and ventilation, which cost $1,350, and the school furniture, which cost $572. The following data as to specifications are of interest: —

Entrance steps and damp course, New Hampshire granite.

Water table and sills, Indiana limestone, drove tooled.

Name tablet, "Verde Antique" Champlain marble, V cut letters, gilded.

Brick (common), best Brookfield, laid Flemish bond, with black headers between damp course and water table.

Ornamental brick, Philadelphia & Boston Face Brick Co., all flat arch brick ground, hollow brick used for inside course of exterior walls.

Concrete floor in basement.

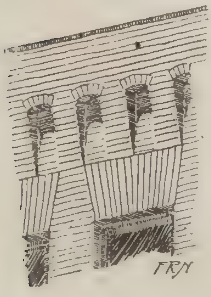
Timber and inside finish, Georgia pine.

Roof, tar and gravel.

Galvanized iron cornice.

Blackboards, 3-8 inch thick, 3 feet 6 inches high, Slatington (Pa.) slate.

Architects: Earle & Fisher, Worcester, Mass.



THE accompanying sketch shows a very effective and very simple and inexpensive cornice of common brick, and proves how much easier it is to do a good thing by not attempting too much ornament and variety.

GEOMETRICAL PATTERNS IN BRICKWORK.

II.

DESIGNS WITH HEADERS, USING TWO AND THREE COLORS.

ON Plate 93 we give a third collection of geometrical patterns for colored brickwork. The two preceding plates gave twenty-three designs, composed entirely of stretchers, and in two colors only. This month we give seven designs composed entirely of headers, and four of these allow of three colors. It is a good rule to follow to limit three-color patterns, and all two-color ones when the contrast is strong, to small structures, or to small portions in large structures when special accent is necessary. In the plate the conventional rendering represents black, red, and buff, and, as is the case with conventional expression of color, the result is more pronounced and more mechanical than it would be likely to be in any actually executed work. It is not necessary to carry out these patterns in the colors indicated, by any means.

Fig. 24, for instance, would work out in two shades of red, with mortar either white, or colored to match the lighter shade, or a light and dark buff, a gray and red, or a buff and red, with mortar to match the lighter brick. The same remarks apply to Fig. 25 and Fig. 26. The latter figure could be used on any small and defined surface that would bear accentuating, as, for example, the side of a chimney.

Fig. 27 is a large all-over pattern that would work out well in two shades of buff, and a Pompeiian for the black bricks in the design. The mortar might be red, but would, we think, be better matching the lighter buff, which is the predominant color, and in this pattern work it is a good general rule to have the mortar colored to match the predominant color.

Fig. 28 would work out in the same manner, though a gray and two shades of red might be effective. This also will apply to best advantage on a limited surface.

Fig. 29 is adapted to broad surfaces, when a large pattern is needed to hold the scale of the building and relieve monotony. Two shades of red and a greenish black, laid in white mortar, the reds being none too carefully sorted, ought to come out well.

Fig. 30 will stand two dark colors and a contrasting light, as the predominant tone would be dark, and the relative amounts of surface will allow a stronger difference than ordinarily in the light brick. For quiet effect, two dull shades of red and a gray, laid possibly in gray mortar, would be effective.

This class of patterns is not of very general application, though, as in the case of American bond, there is no limit to the number of combinations. When the simpler diamond forms are departed from, trouble is close at hand for all, except those who are endowed with a decorative sense or a good training in the principles which underlie decoration. It is in the more common bonds that the best work comes, the Flemish being particulary adapted to diaper work.

As an example of good use in a quiet way, of a diaper pattern, refer to the photograph on page 251 of a house at Allegheny. It is barely noticeable, and is formed by sorting the bricks into extremes of shade.

BRICK STABLES.

IN our Baltimore letter in this number are some very good suggestions for simple brick stables that may prove useful to many a contractor.

AN ARCH AND A CORNICE.

ON page 242 are two drawings of a cornice and an arch motive, from Padua. While the cornice might prove rather difficult to approach without special terra-cotta work, the arch motive will work out fairly well with American stock patterns, and, by carefully consulting the catalogues of one or two leading makers, ornamental brick can be selected which will give practically the same effect.

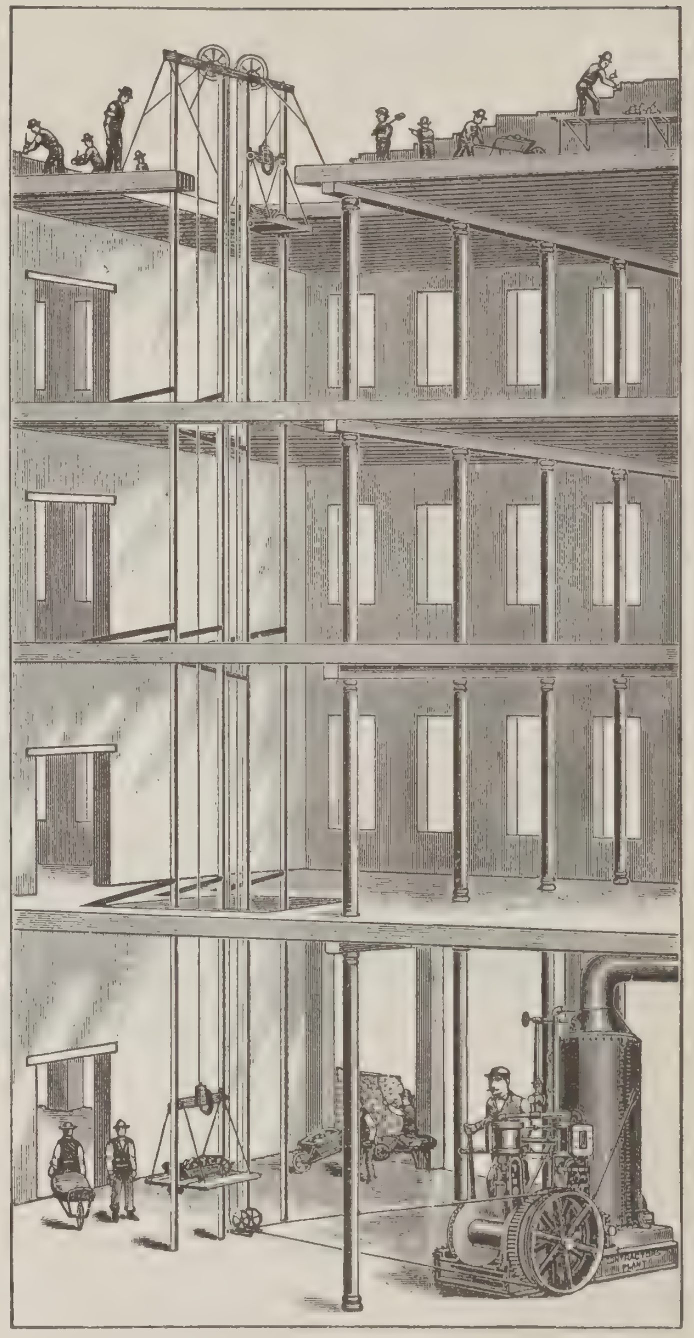
BRICK WINDOWS.

PLATE 88 shows an extremely good design for a group of four windows arranged in pairs. This suggestion is of direct value to every intelligent builder, for if one is at all apt at adapting ideas it will be not only comparatively easy but, at the same time, a very entertaining piece of work to mould this motive to fit actual work. A third pair of windows could be added to the group, and would work out finely for the second floor of a two-story store front. The bracketed stringcourse could be carried across the entire front, and if desirable, the broad piers between the pairs of windows could be narrowed or widened. The arch motive and the filling of the tympanums would present no difficulty, though terra-cotta might have to be used if the bracketed course were to be closely followed.

CONTRACTORS' ADDRESSES.

WE would like the address of every brick manufacturer who also contracts for brickwork, in order to send him a copy of the number containing our new Mason Contractors' department. Brickmakers who know of contractors in their locality likely to be interested in this new department are requested to forward names and addresses.

THE department of Mortars and Concretes is one that no mason contractor can afford to skip, as it will each month contain material of direct practical value to him.



Builders' Portable Material Elevator.

◆

A most complete outfit for the elevation of materials. Will supply 100 masons with material on almost any height of building. Two balancing cages leave only weight of material to be raised. Changes made from floor to floor easily and quickly. The engine is complete with boiler, injector, safety-valve, steam gauge, and all connections, and is mounted on a steel frame. It has double cylinders, with reverse motion and friction drum foot brakes. Entire outfit is compact, easy to move, and simple to operate. Estimates and full particulars furnished upon application.

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FOR DERRICKS, WINCHES, ENGINES, AND ALL CONTRACTORS' SUPPLIES, GET OUR ESTIMATES.

◆

Contractors' Plant Mfg. Co.,

129 ERIE STREET, BUFFALO, N. Y.

THE MANUFACTURER.

A Department devoted to the Market Side of Clay Production.

BUCKEYE TRADE TOPICS.

CLEVELAND, November, 1894.

TO write a market review or a trade retrospect without reference to the memorable depression now drawing to a close would be omitting a vital feature. It is not necessary to quote the chronic croaker and calamityist in order to give tone to what we have to say of the past irregular condition of the brick market. It is quite natural that a commercial demoralization continued for more than a twelvemonth would affect the building trades, although, on the other hand, the depreciation of land and building material values should enhance the desire to build, particularly among people who need not depend upon wage-earning. Unfortunately, however, neither the moneyed nor the wage-working classes showed a disposition to avail themselves of the great opportunities thus offered, although the latter were given every inducement by the professional house builder or allotment agents.

Under ordinary conditions, Cleveland is a fast building town. Her wide area of residence property and unparalleled railway facilities to and from the suburban regions are in themselves suggestive of endless exploits in the building line. A city with such an abundance of land suitable for residence purposes, and such a variety of desirable sites, is naturally a city of homes, *i. e.*, homes owned by residents. Prior to the languid condition of affairs, one could travel for miles about Cleveland, and on every hand sight the beaver-like activity of her home builders. Then ensued the calm period, and a marked periodicity has attached to home-building progress ever since. In the business districts a like condition became prevalent. Scores of new and reconstructed business buildings had been planned, but they remained projects. It was an embryo condition all along the line, but the innate goaheadativeness of the American race soon wrested itself from its narrow confines. To-day we behold the *avant-couriers* of an unprecedented building activity, and old-time prosperity is not yet in sight. But to find a thing one must seek it, and success seems the greater when in pursuing it you meet it "half ways." Other communities would call Cleveland's building activity a boom, but a Clevelander is constitutionally against booms, and prefers the more sober Websterian appellation — activity. Within the past six months or so several great business blocks have been completed, and the foundations laid for more. The architects and contractors are busy looking after their commissions in the house-building line, for Cleveland means to not only renovate itself, but to add more architectural attractions to its galaxy of sky-piercing edifices and houses of God and man. And what is more, more substantial, more modern, more useful and ornamental material is being employed in the construction of new or reconstruction of razed buildings.

Brick in its many forms, from its pristine conceptions up to the artistic and scientific achievements of the day, is more than ever holding its own among competitive material. The frame builder of the earlier century is no longer a prophet; nor do his sanitary, hygienic, or economic principles hold good. In a few years the central business portion of Cleveland will be entirely free from antiquated or new frame structures, the work of annihilation having commenced in the later eighties. As to residences, there is also a tendency to substitute brick for wood, as the comparative cost is no longer a consideration. The carpentry class has lost its prestige as advocates, the frame-house cranks have been relegated to log-cabin history. If the architect be allowed to choose for himself he will, in most cases, base his estimates upon brick material, with or without stone and iron. Wood is no longer a factor; besides, building lumber is no longer a cheap material, nor is it a desirable material when we have to reckon with the insurance companies; besides, the wear and tear of modern industry render wood not only expensive but useless as material for most manufacturing plants. Then again is the intrinsic value of timber depreciating, which is not only due to atmospheric influences but the artificial treatment in the mills.

Thus, as a competitor pioneer, carpentry methods, modes, and models are no longer an immovable obstacle in the path of the advancing brick-building era. True, there is a new and grosser factor to contend with — iron, and occasionally paper. Stone, the ideal material of the ancients, is also entering upon a new era, but being not so accessible as iron, it will never again win back its Roman prestige and ubiquitousness. Cleveland is both an important stone and iron town, and it goes without saying that the people engaged therein are very active in counteracting the brick prestige and influencing the building market against it. Thanks to the latter-day evolutions in brick manufacture, the counteraction of these competitive factors remains barren of results, as a rule, excepting in cases where stone would prove the better component for practical or scientific reasons, if such actually exist. The ever-increasing contact of Americans with continental Europeans in European cities, a great many of which are models of brick architecture, has done no little in convincing the ever-observant American that there is more beauty in a natty brick home than in a gayly painted wood-clad and wood-gabled cottage or villa whenever the abode is to be a permanent one. This same American, once upon his shores again, remembered that his country's brick industry was a thing to be proud of, for its fame was echoed to him in other lands; he also remembered having read in some scientific publication that to move a brick house intact was no more of an impossibility than the rolling away of a frame house, should such a contingency ensue.

Of course, both stone and iron have their superior uses in architecture, and that they supplanted wood is rather an achievement than a calamity, but when employed in the construction of chimneys, cornices, arches, belt courses, or other ornamental parts, we say they are out of place. Recently we have noted the introduction of steel stacks, but experience has taught that a brick lining to these stacks would greatly improve their service and age. Had these stacks been constructed of brick in the first place, no trouble would have ensued during their natural life of serviceability. The idea of constructing a building of wood and then cover it with corrugated or other plate is certainly very modern, and moderner still is the plate building without a wooden lining; but information gathered as to the practicability of these structures is not very favorable as a recommend. It appears as if these very buildings, had they originally been constructed of brick, would not only have outlasted the modern fangles many years, but would have been far more recommendable from an economical standpoint.

It has been said that Cleveland's brick-manufacturing industry has seen its halcyon days. What injustice and rot! The business was never greater. No one will dispute that profits have decreased; that dividends are no longer enormous; that brick kings are a thing of the past. One must consider the over-productive market together with the sharp competition from the outside. Cleveland has yet manufacturers known the country over, and puts out some specialties in new staples which have a good renown. Several outside manufacturers maintain offices here, which goes to show that Cleveland is a desirable home and distributing market. Brick is not proscribed in this market, although certain manufacturers have been guilty of poor production. It is the disgruntled hand brickmaker out of a job who jeers Cleveland's brick industry, and cries down the heavens upon his competitor — machinery.

I. B. R.

TRADE NOTES.

Yard Equipment.

M. H. CRUMP, Bowling Green, Ky., wants information about latest lime kilns.

THE WEIR BRICK COMPANY, of Elmira, N. Y., is erecting fourteen new kilns.

THE SHALE BRICK COMPANY, of Catskill, N. Y., have invested $70,000 in the erection of a plant.

THE ALBANY, GA., BRICK COMPANY are about to rebuild their plant, which was recently burned.

THE STEWART BRICK COMPANY, of Parkersburg, W. Va., will put in machinery for 15,000 pressed brick per day.

AN extensive deposit of good fire-clay has been opened up at Latrobe, Pa., and arrangements are under way for working it.

THE EDWIN BENNETT POTTERY COMPANY, Baltimore, will increase its output one fourth, giving employment to one hundred more hands.

D. B. ANDERSON, of the Great Western Fire Clay Company of Toronto, Ohio, has patented important improvements in sewer-pipe machinery.

THE MILL HALL (PA.) WALL PLASTER is in the market for a mill to manufacture wall plaster. The company wants a mixer for dry material.

Clay Materials.

ON another page appears the new advertisement of the Pennsylvania Enamelled Brick Company, formerly the Griffin Company. The very high standard of this concern's product needs no reiteration here, and it would seem that, with the backing of Mr. William F. Burden and the management of President James L. Rankin, success is already an assured fact.

WE would call attention to the advertisement of the Somerset and Johnsonburg Manufacturing Company which appears on page iii. This company is making a very fine enamel brick which is growing in popularity very fast. A few of the many new buildings wherein their enamel bricks have been used are, the Massachusetts State House extension, Wentworth Building, city of Boston; Chester Park Hospital, Boston; White Dormitory, Yale College, Hartford; and Carnegie Library, Pittsburgh.

ANY manufacturer who can show a letter like the following from so large and exacting builders as the famous George A. Fuller Company has reason to be proud :—

CHICAGO, Nov. 2, 1894.

J. VAN INWAGEN, ESQ., President Tiffany Pressed Brick Company, 403 Chamber of Commerce Building, Chicago:

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Yours truly,

GEORGE A. FULLER CO.,

Per GEORGE A. FULLER, *President*.

Cement Notes.

H. S. DUVAL, of River Junction, Fla., has about perfected arrangements with a Northern syndicate to erect a $50,000 cement plant.

THE MELAN ARCH CONSTUCTION COMPANY has been awarded the contract for a bridge in Eden Park, Cincinnati, for $7,130. The bridge is to be of seventy-feet span, reaching over Park Avenue. Its total length is to be one hundred and twenty feet, width thirty-four feet. The contract calls for completion in sixty days. The Melan System is exceedingly ingenious and well adapted for long-span bridges. Fr. von Emperger, of 71 Broadway, New York, is the consulting engineer of the company.

THE Buffalo *Courier* recently contained an interesting description of the new plant, at Cassadaga, N. Y., of the Chautauqua Cement Comany. A thoroughly equipped plant has been put in operation. The company owns nearly one hundred acres, containing a bed of marl from three to fifteen feet thick lying about two feet below the surface. Beneath the marl is a deposit of clay varying from ten to one hundred and fifty feet deep. The *Courier* states that there are probably thousands of acres of this sort in that section.

Miscellaneous.

J. B. PRESCOTT & SON, of Webster, Mass., manufacturers of the Morse patent wall tie, have recently brought out a veneer wall tie which they will shortly place on the market. The above is a very clever method for securing veneer brick walls to a frame building, and will without doubt have a very extended use.

THE Salamander fireproof composition manufactured by the American Fireproofing Company, Boston, has been placed in the flooring of the new Castle Square Hotel. This adds one more to a large list of prominent buildings in this city wherein the Salamander fireproofing has been adopted on the merits of actual tests.

W. S. RAVENSCROFT, Ridgway, Pa., seeks purchaser for one-half interest in a profitable brick plant.

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THE BRICKBUILDER FOR 1895.

It has become the custom for all periodicals having anything to announce to publish a prospectus for each coming year. As we have a great deal to announce, this custom becomes a necessity in our case. The space we can allow ourselves for advertisement admits of only the most general statement, but with the past year's record of advance in both quantity and quality of published material, we think our subscribers will trust us with satisfactorily carrying out in detail what this prospectus outlines.

REGULAR FEATURES.

Brick and Marble in the Middle Ages.

WITH the December number we finish the first half of our reprint of Street's "Brick and Marble in the Middle Ages." Paradoxical as it may seem, the half that is to come will be twice the size of the half we have covered. This is due to the much better chance the latter part of the book offers for supplementary illustrations, enabling us to publish a much larger proportion of photographs than in the past.

The Art of Building among the Romans.

MR. DILLON'S translation of Choisy's "L'Art de Batir chez les Romains" will be continued, and will present 75 engravings of construction in the text and 23 full-page plates drawn in the same masterly way that characterizes the plates published in May and August. The fact that this article has secured as subscribers whole classes in the various architectural schools should commend the paper on this account alone to all students and draughtsmen.

Recent Brickwork in American Cities.

WE now have an unequalled corps of contributors, covering every American city of importance. In most instances our correspondents are architects of the best standing, thoroughly acquainted with all that is good in their respective cities, and commanding the services of draughtsmen who are particularly brilliant as illustrators. There will be hardly an issue of next year that will not present the cream of recent work in some American city.

Scale Drawings of Current Work.

AS in the past, a large portion of the paper will be devoted to carefully selected scale drawings of elevations and details, of both ornament and construction, representing the best projected work in this country. What the paper has been in this respect is all we need promise for the future. With its increasing strength and popularity, however, it is offered a larger selection of material, which can only result in raising the standard of quality.

SPECIAL DEPARTMENTS.

Our readers cannot help noticing the growth of the several departments into which that part of the paper following the editorial page is divided. These will, during the year, assume the importance of independent periodicals. Even greater care will be observed in their editing than in the preceding part of the paper, and specialists of the highest reputation will contribute. To go into detail as to the staff of writers connected with these departments would take several pages. Only their general character can be here stated.

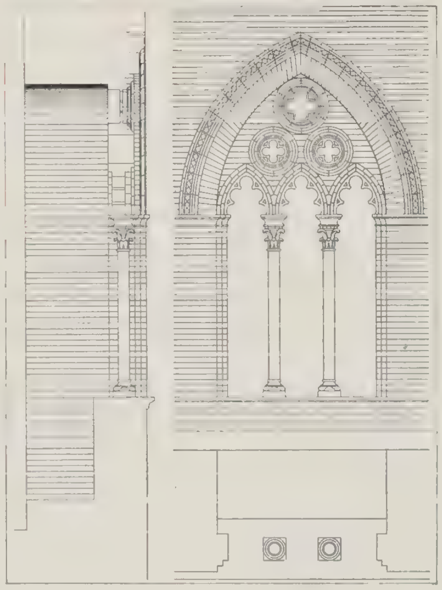
The FIREPROOFING department will contain special articles, discussions and construction details devoted to building for protection against fire; it will keep pace with the improvement in construction which is being daily made. In MORTARS AND CONCRETES we have a strongly growing periodical in itself, one that will be found invaluable to all architects who recognize the necessity of care in successfully employing cementing materials. In the pages devoted to the MASON CONTRACTOR a practical discussion of those matters most needed by the builder, and as yet supplied by no other publication, will be associated with useful details and designs for the smaller class of buildings. In the department of THE MANUFACTURER special attention will be devoted to the market side of the brickmaker's business.

THE BRICKBUILDER is published monthly at Boston, Mass. Publication Office, 85 Water Street.

Subscription price, $2.50 per year in advance.

Special Features of THE BRICKBUILDER for the Coming Year.

TO Italy one naturally turns first for inspiration from Architecture in Materials of Clay, and it is to be expected that in selecting our special features, we give a prominent place to the examples she offers us. The Campanile is an architectural motive in which Italy is particularly rich, and we are fortunate in securing from Mr. C. Howard Walker a series of articles upon Italian Brick Towers. These articles will treat of the several types, with the best example of each, and will be both historical and critical. They will be most profusely illustrated with photographs, and Mr. Walker's unpublished sketches. ❦❦❦ With the increasing interest in the architectural use of glazed and enamelled terra-cotta, attention is turned more and more to Italy, where this art, since lost for several centuries, originated and reached perfection. Very timely, therefore, will be our articles upon The Work of the Della Robbias, and no one is a more close or appreciative student of this work, or better fitted to write upon it, than Prof. Allan Marquand, of Princeton. The articles will be most fully illustrated by photographs from Prof. Marquand's very complete collection. ❦❦❦ Measured drawings of foreign work, when intelligently selected and skilfully executed, are immensely valuable, and we promise our readers a treat in the Twelve Sheets of Measured Brick Details which constitute our third "Italian" feature, to be prepared by Mr. C. H. Alden, who sails this month for Genoa.



Next to Italy in interest for us is Holland, a country whose brick architecture should be better known. Mr. R. Clipston Sturgis has consented to write upon The Brick Architecture of Holland, and no one has a more intimate acquaintance with the subject, or a larger fund of photographs and sketches to draw upon for properly illustrating such articles. Mr. Sturgis's sketches lend themselves admirably to reproduction, as the accompanying sketch of a house at Dordrecht shows, and it will be on this account one of the most attractive articles of the year. ❦❦❦ What American architect is there, who knows the difference between good and bad drawing, that does not know and admire the brilliant pen drawings of Mr. Bertram G. Goodhue? No draughtsman can afford to lose the articles which Mr. Goodhue will write upon The Pen Drawing of Brick Architecture, with their many illustrations from the work of prominent draughtsmen, and the author's many little bits explaining methods of effective rendering. Mr. Goodhue is as brilliant a writer as he is a draughtsman, and has the faculty of making his subject thoroughly entertaining as well as instructive. ❦❦❦ Brick in Cottage Architecture is a subject which we have tried for three years to have satisfactorily treated, and we have now a writer who has thoroughly interested himself and will do the subject full justice. Mr. Ralph Adams Cram will write several papers taking up both the practical (the economic and constructive) and the æsthetic sides of building small houses with brick, and will illustrate them with floor plans, perspectives and constructive details. We reserve mention of Mr. H. Langford Warren to the last, as the subject he will take is yet to be decided upon, but we need say nothing more than that he will write upon something. We think the above programme, taken with that upon the preceding page, will convince present subscribers that no effort will be spared to make the coming year fully worth their continued patronage. To intending subscribers we suggest comparison of our paper with others seeking your patronage, on the points of Quality, Quantity, and Price.

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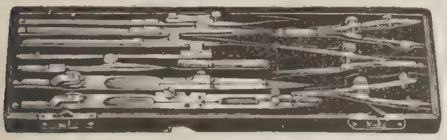

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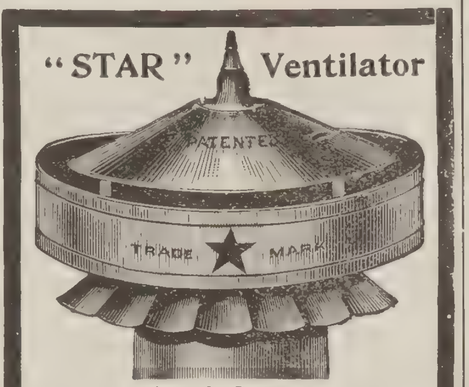

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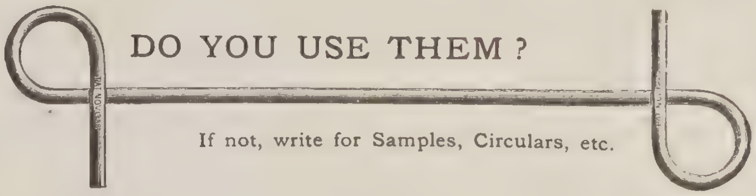

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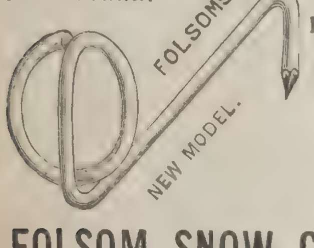

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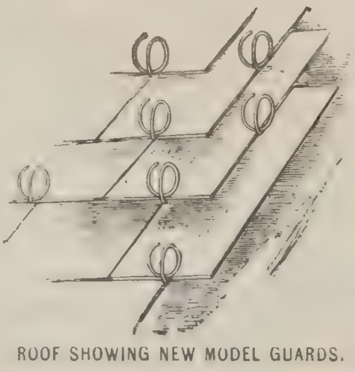

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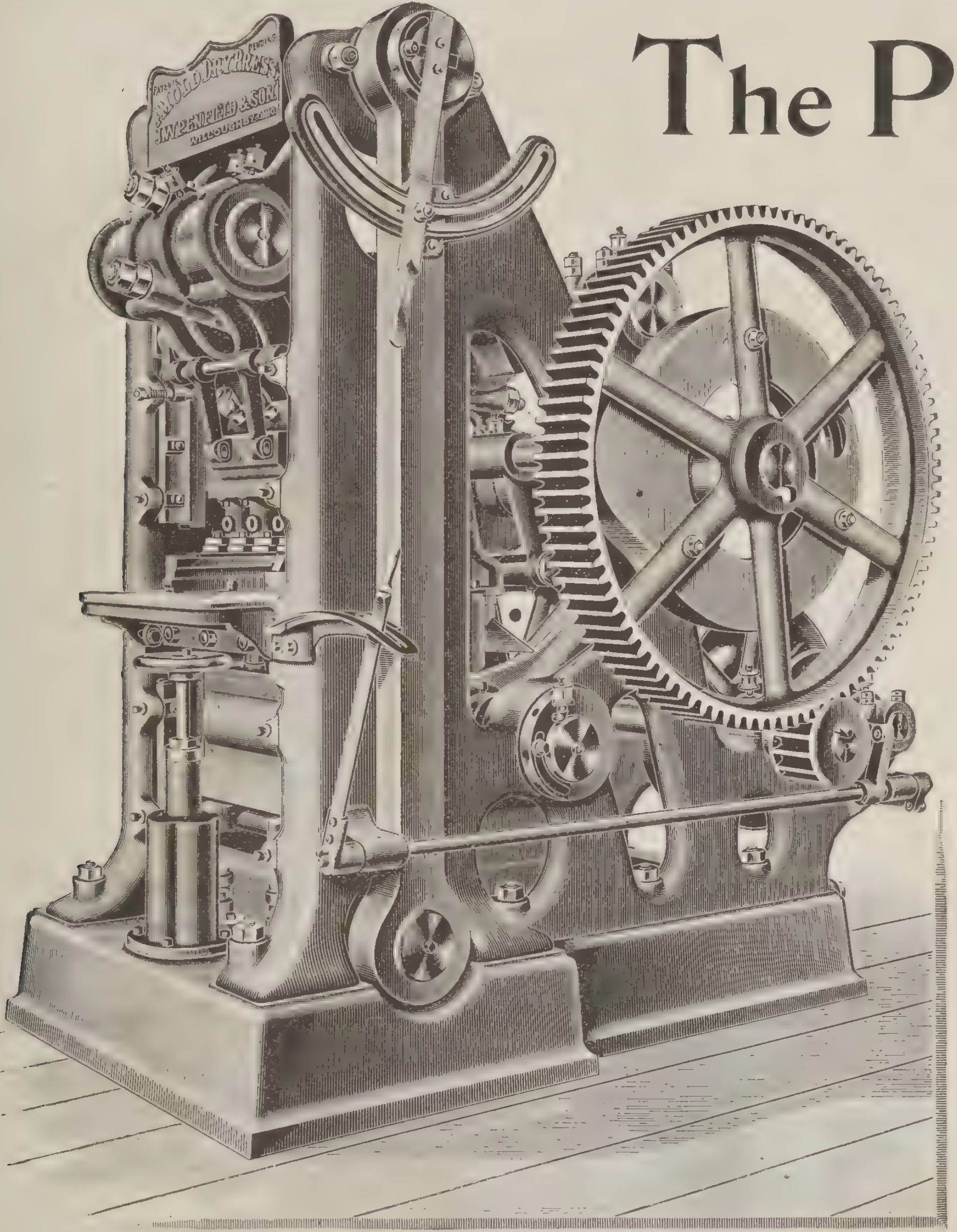

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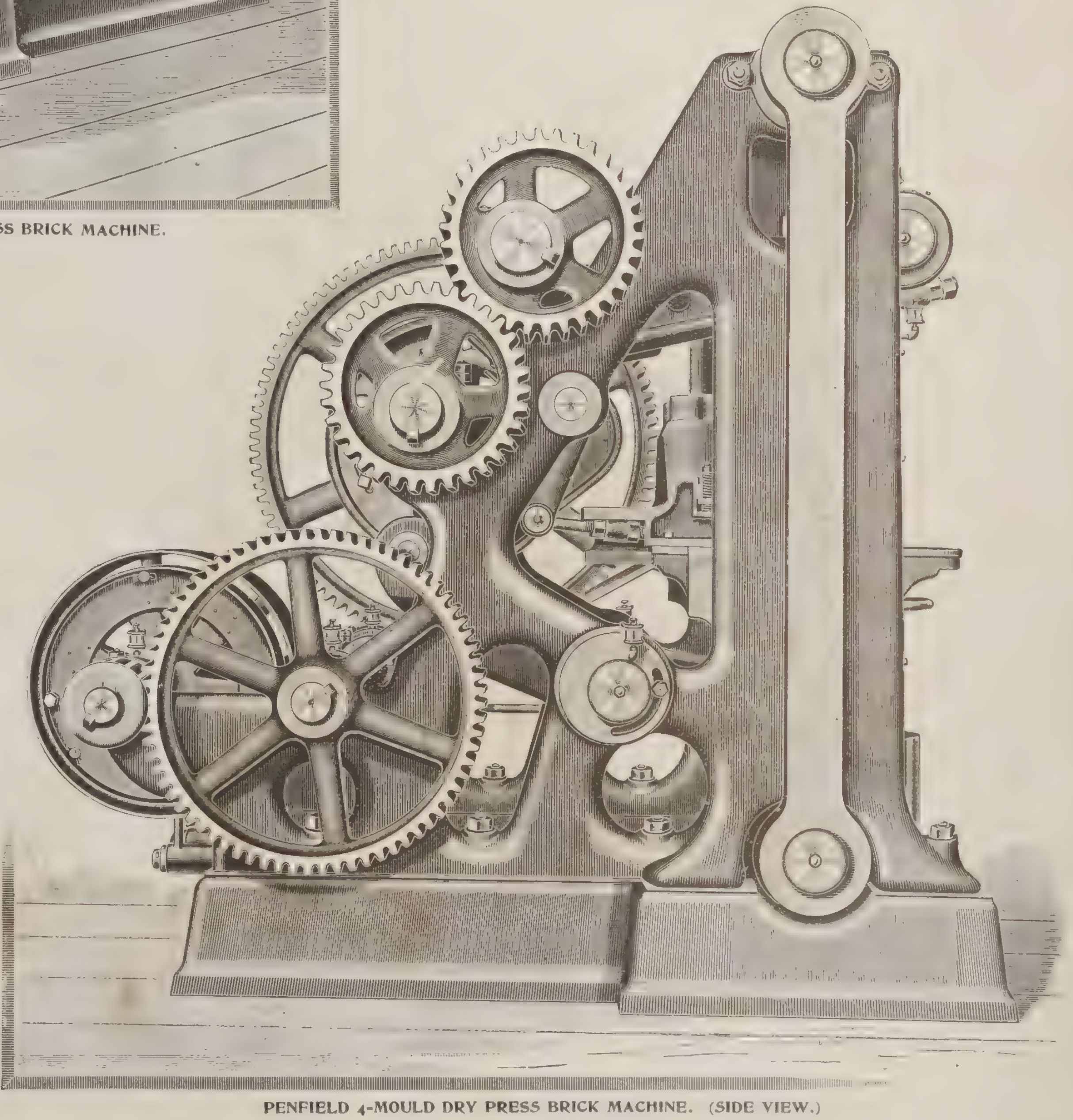

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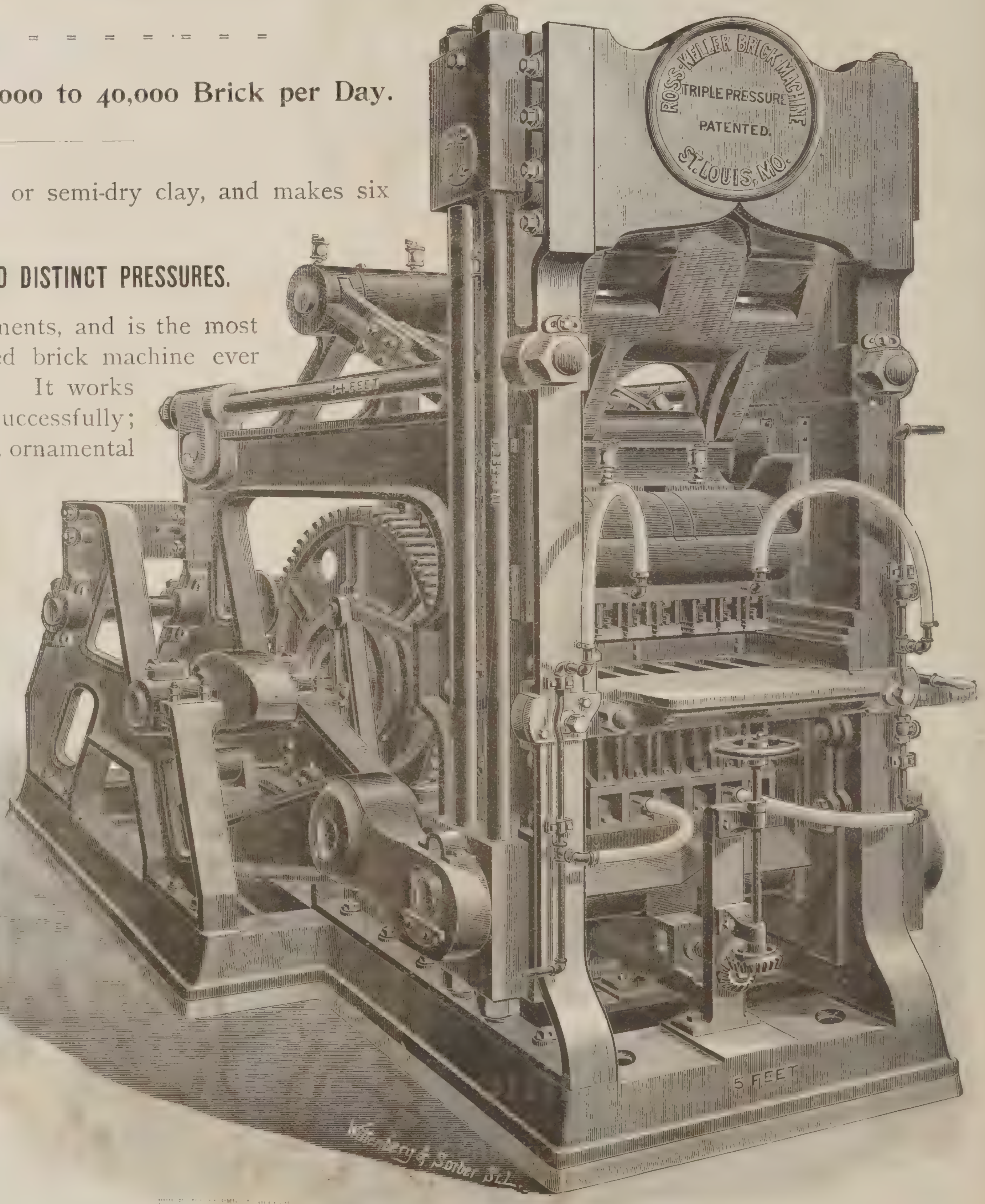

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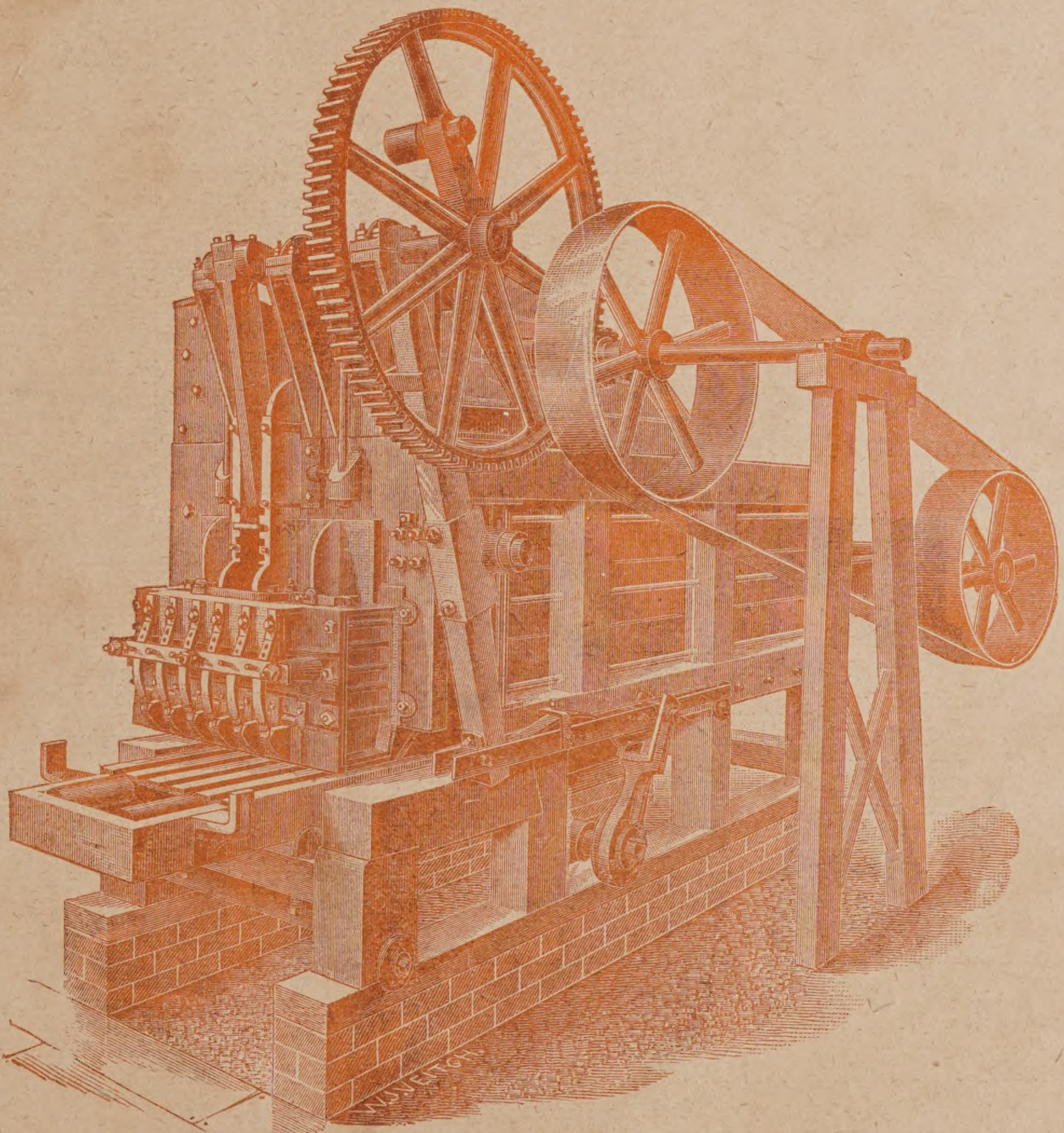

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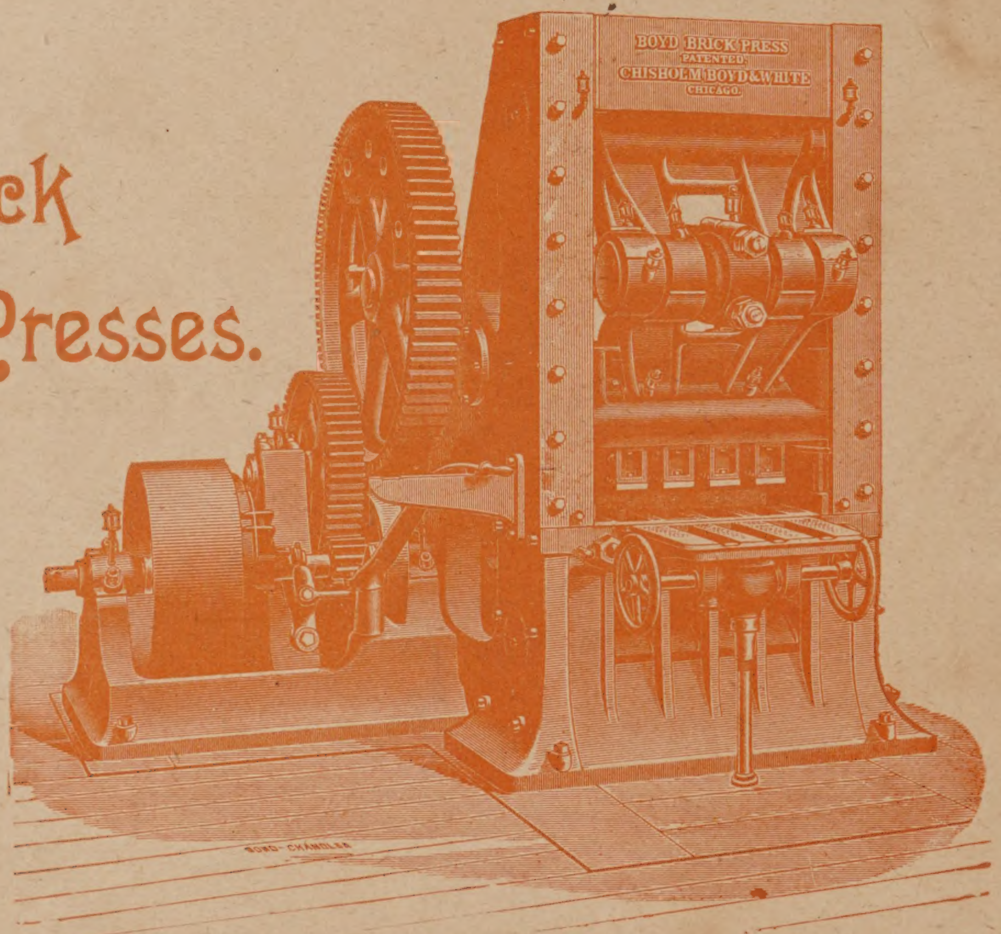

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